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# An analysis of the design principles as applied to static and animated Web sites with an application of the design principles to an experimental static and animated Web site

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An analysis of the design principles as applied to static and animated Web sites with an application of the design principles to an experimental static and animated Web site

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Signatures have been redacted for privacy

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# ABSTRACT

The World Wide Web is the fastest growing media global wide. Web design has become an increasingly sophisticated profession, and its standards and requirements have become more stringent. Static Web design is built upon a system of communication principles. By applying these principles, a non-animated Web site can send information very effectively. With the development of Internet technology, increasing demand for motion on the Web has been put forward by users and clients. From the early day's <blink> tag, to today's fully animated Web site, Web animation has progressed to the point that it is impossible for any book to cover this topic thoroughly.

Animated Web design is a new term; many people do not know the difference between Web animation, flashing banner advertising, and motion design. Animation extends Web design language and methods. Animation makes information communication more effective and direct because of the visual impact and graphic nature of the animation. The purpose of this thesis is to examine the effectiveness of animation on the Web by studying the principles in both non-animated and animated Web design. In fact, it is very important to apply non-animated Web design principles to Web animation.

The research also found that knowledge of traditional animation principles is a must for today's Web designers. This research can be used as a guide for applying the design principles when creating Web animations. As technology and industry develops, further research in the area of Web animation is required. The design principles, however, will remain fundamental to the field of Web site design.

# CHAPTER 1. INTRODUCTION

What is unique about the Internet in terms of information communication? The answer is: the Internet is a combination of traditional media such as magazines, newspapers, books, mail, telephones, even television and movies. Internet users receive enormous amounts of information by reading articles and news reports on Web sites just like people who browse traditional publications. Internet users can exchange information with other users instantly through Web sites or email; here the Internet functions the same as mail and telephones by connecting to remote networks. Users can now get multimedia formats such as animations and movies on the Internet instead of watching TV or going to the cinema.

The Internet not only combines traditional media, but it also adds a new interactive feature in the media. Users can interact with other networking groups by chatting and emailing with other people. They can also interact on Web sites. By clicking links, users can browse information on other pages and sites.

Internet technologies are changing rapidly. Fifty-six kilobytes per second modems, cables, and DSL (digital subscriber line) technology provides faster Internet access to average Internet users. The just-released 1GHZ processor enables Internet users more speed and space for downloading multimedia files. Browser technologies are getting ready for multimedia designs. Flash player, Realplayer, and Quicktime Shockwave player are popular choices for users. According to a Networking User Associate Internet survey, "88.4% of browsers are setting Flash player as the default. Others, like Quicktime player, and Shockwave player, are either setting as default or download for free."

Multimedia Web design software and coding languages are becoming more mature and competent in multimedia and animated Web design. Software such as Macromedia Flash 4, Dreamweaver, Adobe GoLive, and so on, can easily handle complicated shapes and a wide-range of colors. Particularly, the software allows designers to create more sophisticated and complicated motions. JavaScript, DHTML, and XML are the new markup languages specifically designed for Web animation and multimedia features.

Most designers coming to Web design do so from publication design backgrounds. The fundamental graphic design principles used in designing publications are strong communication methods for designing static Web site. Web designers apply principles such as consistency, simplicity, visual hierarchy, and text legibility to static Web design, thus creating an information structured design. This makes the Web site easy to navigate, read, and use. Beyond these foundations, however, one must not forget that the unique characteristic of the Internet combines several traditional media. The Internet is a digitalized network using monitors and speakers as informational display vehicles. The digitalized display will decide the future of Web design because it can simulate the real world through image, text, sound, movement, and timing. Web designers should, therefore, be ready with their multimedia and animation knowledge for the next generation of Web design.

## A. Thesis Objectives

The goal of this thesis is to examine the communication effectiveness of Web animation by studying, comparing, and analyzing both non-animated and animated exemplary Web sites, and to design a prototype that applies the principles learned from this study.

From the button roll over effect by JavaScript in the beginning of animated Web design, to fully animated Web by Macromedia Flash, more and more Web sites use animation in their designs. Multimedia interactions will dominate the Web in the near future.

Designers and engineers still pay more attention to the technical aspects of Web design rather than the design disciplines. Many books discuss Web animation techniques such as GIF, JavaScript, and Flash. Several books such as *Designing Web Multimedia*, by David Miller (1996), *Designing Interactive Web Sites,* by Gong Szeto (editor) (1997), and *Designing Multimedia Web Sites,* by Stella Gassaway (1996), are more focused on the techniques of designing multimedia Web sites. Many people who apply moving elements into their Web design that lack an understanding of basic design principles, namely consistency, visual hierarchy, staging, and timing.

The literature review first gives an overview of the World Wide Web technology and the history of the Internet, explains the background and environment of today's fastest growing medium, and the future of WWW technology. The literature review will then focus on the design principles of both non-animated and animated Web sites; analyze the concept and basic elements design methods in these two kinds of Web sites as well as discuss the limitations and the principles of each. The second step is to analyze several animated web sites by applying the principles of static and animated Web design. The experimental static and animated Web designs created by the author are also analyzed, based on the results of design principles studied and analyzed in the literature review sections.

## B. Methodology

The thesis is divided into six chapters. Chapter one, *Introduction,* covers the definition of the Internet and the development of Internet technology as well as the future of Web site design. Chapter two, *World Wide Web Today,* discusses the development of the WWW and the WWW technology in-depth, including the modem, processor, wireless Internet access, Internet2, and the next generation Internet project. New markup languages and multimedia Web design software are also discussed in this chapter. Chapter three, *The Design Principles of Non-Animated Web Site,* analyzes the basic design principles of non-animated Web sites. Chapter four, *Understanding Web Animation by Studying Traditional Animation Principles,* focuses on traditional animation principles and how to apply these principles to Web animation. Case studies will be provided in this chapter to further analyze current exemplary animated sites. Chapter five, *Analyzing the Effectiveness of Web Designs by Comparing Non-animated Web Design with Animated Web Designs,* evaluates and analyzes some exemplary Web sites. The experimental Web sites designed by the author include a static and an animated site are also analyzed, according to the design principles suggested in the previous chapters. The result of this study is discussed in chapter six, the *Conclusion.*

# CHAPTER 2. WORLD WIDE WEB TODAY

The Internet is the fastest growing media in United States. Nearly seven-in-ten Americans (68%) now use a computer on at least an occasional basis, up from 61% in 1998 and 58% in 1996. The number of Americans who go online has increased at an even greater rate, more than twice as many people now go online to access the Internet or send and receive email as did just four years ago (54% vs. 21% in 1996). The percentage of Americans regularly reading online news has increased greatly from 20% to 33%. By contrast, viewership of broadcast network news has fallen dramatically from 57% in 1998 to 51% in 2000 (The Pew Research Center, 2000).

The initial prototype of the Internet is often called the National (or Global or Galactic) Information Infrastructure. Its history is complex and involves many aspects--technological, organizational, and social. Its influence reaches not only to the technical fields of computer communications but throughout society as we move toward increasing the use of online tools to accomplish electronic commerce, information acquisition, and community operations. The first recorded description of the interactions that could be enabled through networking was a series of memos written by J.C.R. Licklider of MIT in August 1962 discussing his "Galactic Network" concept (Leiner 1996, p.26). He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. The concept was very much like the Internet of today. It was Leonard Kleinrock at MIT who first published his paper on subject of packet switching theory (Leiner 1996, p.4). The key concept of this theory was using packets rather than circuits as path to conduct computer networking. The other crucial step was to make

computers "talk" to each other. To explore this, scientists Robert E. Kahn and Thomas Merrill connected the TX-2 computer in Massachusetts to the Q-32 in California with a low speed dial-up telephone line creating the first wide-area computer network ever built (Leine 1996, p.14). The results convinced scientists that time-shared computers could work well together.

In late 1966, Robert E. Kahn developed an "ARPANET" plan for DARPA (Department of Advanced Research Projects Agency); right after that, Network Measurement Center at UCLA was selected to be the first mode on the ARPANET. Four host computers were connected together into the initial ARPANET at the end of 1969. It was in 1972 that the initial "hot" application, electronic mail, was introduced. During the early 1980s, all the interconnected research networks were converted to the TCP/IP protocol (Transmission Control Protocol/Internet Protocol). This enables all of the networks of the Internet to send data back and forth, and the ARPANET became the backbone (the physical connection between the major sites) of the new Internet, which comprised all TCP/IP-based networks connected to the ARPANET. This conversion to TCP/IP was completed by the end of 1983 and the Internet was born (Leiner 1996, p.28).

In 1990, Hypertext Markup Language (HTML), a hypertext Internet protocol that could communicate the graphic information on the Internet, was introduced. Each individual could create graphic pages (a Web site), which then became part of a huge, virtual hypertext network called the World Wide Web (WWW). This enhanced Internet was informally renamed the Web and a huge additional audience was created. Now that the Internet has been opened to commercial and private sites, new services are being developed that are easier to use, and new interfaces are designed to be friendlier. According to NUA Internet Surveys, an

online survey company, 248.6 million people were online worldwide in January 2000. The number reaches to 106.3 million in the US alone.

The World Wide Web is a different term compared to the Internet. The Internet already existed and had for a decade and a half before Tim Berners-Lee at CERN (European Particle Physics Lab) invented the World Wide Web. The initial purpose of the Web was to create a common information space in which we communicate by sharing information. Its universality is essential; a hypertext link can point to anything, be it personal, local or global, be it draft or highly polished (Berners-Lee 1998, p.16). The second part of the thought was to make the Web become a realistic mirror of the ways in which people work, play, and socialize. What was once the territory of scientists' interactions on line, people could now use the Web to help them analyze subjects, and work better together with the connection of the Internet (Berners-Lee 1998, p.4). The Web turns out to become the global-wide new way of communication.

The World Wide Web is a system of Internet servers that supports hypertext to access several Internet protocols on a single interface. The World Wide Web made documents, sounds, videos and information accessible to users by simple clicks on hypertext links (W3C 1999, p.23). Because of this feature, and because the Web is able to work with multimedia and advanced programming languages, the World Wide Web is becoming the fastest-growing component of the Internet.

### A. The Development of WWW

The development of the WWW has made many things possible. For example, people can chat online to someone whom they are never met or to someone on the other side of the

world. People can see many different things and get information from all over the world by browsing certain Web sites or downloading music, videos or games from entertainment Web sites. At the same time, the growth of Internet technology has supported the growth of World Wide Web. In the following sections, the author will research the development of the WWW as well as the most advantageous Internet technologies in today's market and the next generation of Internet.

When the father of the WWW, Tim Berners-Lee, first invented WWW browsers in 1990, he called it the "*WorldWideWeb.*" The 1990 version 1.0 browser had separate windows for CERN and a book icon, and the entire thing was in gray scale. This non-graphic, text based, menu-driven interface started the new era of communication revolutions (Berners-Lee 1998, p.2). By 1992, the second year the World Wide Web had been released, the number of hosts broke 1 million, and news groups broke 4,000. The first multicast backbone (MBONE) audio and video multicast was released in the same year, and those multimedia features changed the interface of the Internet. By 1993, the number of hosts increased to 2 million and there were 600 Web sites. The directory, database services, registration and information services started to launch on the Internet. It was then that the World Wide Web revolution truly began. As the Internet hosts reached 3 million and the Web sites reached 10,000 in 1994, commercial Web sites began to wire up directly to the Internet (History of the Internet 1998, p.18). Greater numbers of Internet users started shopping online and the first virtual cyberbank opened for business. People realized that a new way of life had started. Some people believe that the nations that have been separated by wars, languages, races, and geographical boundaries are virtually reunited by the Internet.

According to CNN's report, consumers are now realizing that it is more enjoyable to shop online. In 1997, people began to feel comfortable making small purchases, such as items for $50. Now, more people are purchasing expensive items, such as $1,500 plane tickets, and $2,000-$4,000 computer items. 1998 projections for travel are $1.8 billion; personal computers, $1.8 billion; groceries, $270 million; specialty gifts, $219 million; books, $216 million; event ticketing, $127 million; music, $81 million and clothing, $71 million. Everything people can buy from retail stores, buyers can now buy online. The boom of e-business is an important result of the development of the Internet technology and Web site design (CNN.com, 1999).

## B. The WWW Technology Today

It was not a long time ago that Web pages were text-based with the occasional image. The text was set in either Helvetica or Times Roman. Background color was set in gray and the links were set in blue. The Web design was more about knowing HTML coding than the design principles. Today, Web sites are alive with colors, motions, and sounds. The servers are capable of transmitting more information and handling a larger number of users. Powerful software, such as NetObjects Fusion and Macromedia Flash have removed the need to deal with most of the behind-the-screen scripting. Web designers feel more comfortable designing work by only using this software. The WWW technology is ready for more sophisticated multi-media Web design.

## 1. WebTV and Desktop Video Publishing

WebTV is a new term that came out after wide recognition on Web sites. Basically, it makes the Internet accessible to anyone, even those without a computer. It allows the Web to be viewed by people not through a computer, but on a television set. WebTV classic comes with a 33k modem which is slower than the average 56k modem of today's computer. The screen size of WebTV is about 544 pixels in width, and no matter how big the TV screen is, it will automatically adjust the page size to screen size.

Designing for WebTV is not as flexible as designing Web pages on the computer (Priester 2000, p.12). The limitations of WebTV are greater than the Web in terms of design. First, it supports only two fonts, Helvetica and Monaco. Certain colors such as pure red and bright-colored backgrounds do not work well on WebTV even though these are successful colors when displayed on a monitor. Since WebTV does not have a keyboard with it, many WebTV surfers have to use the arrow buttons on the remote control to navigate the sites.

The boom of online videos and animations are a result of the "Blair Witch Project," a low budget film that hit filmmaking industry and viewers in 1999. "The project was famous for being filmed with a camera bought at Circuit City, edited on a $3,000 shoestring budget and promoted on the Internet. The project makes millions of people believe they can go through exactly the same process for less than $3,000" (Taylor 1999, p.2). Apple was the first company to see this potentially huge market and is now promoting a whole series of easy-to-use desktop video publishing systems. Users can simply connect digital camcorders to iMac's built-in Firewire port and launch iMac's iMovie software. FireWire is "a high-speed serial input/output (I/O) technology for connecting peripherals to a computer.

Originally developed by Apple, FireWire is now an official industry standard" (IEEE 1394). With a FireWire cable, users can transfer digital video from a camcorder to the computer with a speed of 400Mbps. iMovie has a simple user interface with pull-down menus and icons that represent familiar tools and objects. With iMovie, users can cut and paste text, graphics, and add sound and music. Users can also post the movies on the Web or send it via email (Apple.com 2000, p.16).

Using built-in FireWire technology, Apple enables multimedia peripherals such as video camcorders, music synthesizers, and hard disks to perform at higher speeds. Because of its multiple device-supporting feature (supporting up to 63 devices), many manufacturers have made video, photographic, storage, printing and other peripheral devices for FireWire. Like Digital camcorders, DV (Digital Video) stores the incoming audio and video on tape in a digital format. DV produces full-size, full-motion video of 720 by 480 pixels at 30 frames per second. The speed of transferring a motion video file between the camera and the computer is at 3.5 megabytes per second (Apple.com 2000, p.17).

**2. Wireless Internet Access**

Wireless Internet access is becoming popular. For people who need to have Internet access under special circumstances, this technique is undoubtedly the only choice to solve that problem with today's technology. The following example shows how it works:

> For the New York Presbyterian Hospital (NYPH) Organ Preservation Unit, which procures and preserves human organs for transplant, a few minutes can be the difference between life and death. Preservationists who are often working at the bedside of a patient or in a moving ambulance, now use laptop PCs equipped with

> special modem cards and antennas to post digital pictures of organs and the organ's vital statistics on a Web site. As the Internet increasingly becomes important in some fields, more and more organizations are beginning to look to wireless technology to allow employees such as traveling business executives, salespeople and field workers to log on from anywhere at any time (Hicks 1999, p.56).

Wireless LAN access devices include a set of products to provide wireless Internet access from airports, hotels and other public places that do not have telephone line services (Nobel 2000, p.34). Lucent Technologies Inc. is the pioneer in promoting wireless Internet access. Lucent's 11megbytes wireless LAN access points focuses on three venues: the home, enterprise and public venues. Proxim Inc. has already developed a wireless LAN for public places such as airports and hotels. Users can gain access via specific software called MobileStar along with PC Cards and access points from Proxim Inc. Some people who have used wireless access think it is at least 20 times faster than 56k modem speed. To get wireless LAN access is only the matter of the cost of rebuilt penetration at the major public spots and in all major equipment. Experts believe that the trend to push wireless networks into the home and public areas will increase once the technology hits speeds of 5GHz. The experts believe this will happen within a couple of years. This change will bring more opportunities and users to WWW (Nobel 2000, p.37).

### 3. Internet2 Project and Next Generation Internet Project

The growth of the Internet is 100 percent per year since 1988 and the Internet traffic has been growing at 400 percent per year. It was expected that by the year 2000, more than half of the U.S. population will be able to have access to the Internet. Furthermore, the

demand for higher bandwidths and multimedia applications is increasing enormously. In order to meet the demands of users and allow American industry and the public to benefit from the Internet, U.S. government invests in Internet research and development (R&D) projects, by name of Internet2 and Next Generation Internet project (Izarek 1999, p.11).

Internet2 is a university-led project that researches and develops advanced Internet technology. One hundred and seventy U.S. universities, the government, and about 25 corporations joined together and are working on this project. One of key goals of the Internet2 project is to increase the speed of information transfer from the present snail's pace to something called GogaPOPs (points of presence). The project will enable applications such as digital libraries, virtual laboratories and telemedicine which are impossible with today's technology of Internet available to higher education. Other goals include creating more sophisticated audio and video streaming technologies and true data sharing capabilities (Internet2.edu). According to CNN's report, "MCI claims that the 622Mbps rate is speedy enough to send 322 copies of a 300 page book every 7 seconds." One of I2's immediate benefits is that off-loading academic research and government traffic will surely speed network use for the mainstream as well as I2 Internet users. Eventually, this project will not only benefit academic and federal research networks, but all sectors of society. By early 1999, numerous beta versions of applications were in use on I2 with solutions for the mainstream Internet following close behind (Internet2.edu 1999, p.1).

Next Generation Internet (NGI) Initiative is a project being conducted by the U.S. government directly. According to the NGI implementation plan, the NGI initiative has three goals: first, to advance research, development, and experimentation in the next generation of networking technologies to add functionality and improve performance; second, to develop a

Next Generation Internet testbed, emphasizing end-to-end performance, to support networking research and demonstrate new networking technologies. This test-bed will connect at least 100 NGI sites – universities, Federal research institutions, and other research partners – at speeds 100 times faster than today's Internet and will connect on the order of 10 sites at speeds 1,000 times faster than the current Internet; third, to develop and demonstrate revolutionary applications that meet important national goals and missions and that rely on the advances made in goals 1 and 2. These applications are not possible on today's Internet (Center for Next Generation Internet 1999, p.2).

**4. Modem**

There are several types of modems on the market. The most commonly used modem is the dial-up modem. A dial-up modem may be an internal or external device, and must connect to a serial port on a user's computer at a maximum speed of 56kbps.

The cable modem is what scientists and engineers believe will change the recent situation of data transmission rates. Today's cable modems are external devices that connect to a network card in a user's computer and support much higher speeds than dial-up devices. Some cable networks claim speeds up to 36mbps, but the practical top speed a modern PC with an Ethernet card can support is 10mbps. However, the cable network is designed to support the highest speeds in the "downstream" direction, which is from the Internet to user's computer. The "upstream" bandwidth, the data sent from a user's computer to the Internet, is typically less (in the range of 200kbps to 2Mbps).

The USB modem is more convenient than serial port connections because it supports plug-and-play installation. This means that users can just plug in the modem and use it

without worrying about various switches, jumpers, and other configurations. Also, because a USB modem gets it power from the USB port, external power supplies are eliminated. Although the USB is overkill for a 56kbps modem, users can attach up to 127 devices in a single chain to share that speed (Norton 1998, p.3).

The DSL modem is known as Digital Subscriber Lines modem. This special solution runs over POTS (Plain Old Telephone Service) and delivers massive output at a low price. Many ISDN modems can be used to run DSL. DSL cards are starting to show up on the market and experts are optimistic about its future. The industry hopes it can become as common as regular modems and cable modems (Norton 1998, p.4).

**5. Processor**

The processor is what people call the "heart" of a computer. It is what makes computers run. A powerful or faster processor is essential for the speed of Internet, especially for downloading audio and video content on the Internet. The processor is the determinant in application operation, and even in Internet accessibility. On March 8th, 2000, AMD unveiled a 1 gigahertz processor. This makes computers 10 times faster than those made just six years ago. The 1GHz AMD Athlon processor will be very powerful by operating numerous power-hungry applications, such as digital content creation, imaging and graphics development and multimedia Web development. The release of the 1 GHz processor certainly fits in with the need for speed as the computer shifts from its current role as a device used mainly for word processing, surfing the Internet and playing games into a central hub that connects various devices in the home to each other (Advanced Micro Devices Inc. 2000, p.13).

## 6. Web Browser Technology

The purpose of a browser is to display and transmit text information and pictures from server to server, or from server to the end user's computer. The browser normally has a navigation bar to provide back, forward, stop, or reload etc. functions to Internet users. There are certain browsers for certain platforms. Browsers are divided into two major categories: text based and Point-And-Click Graphical User Interface (GUI) along with the platforms they support.

### a. Text based Browsers

Lynx is an example of a text-based browser. Compare to other text based browsers such as Wanna-Be Web browser and W3C Line Mode browser, Lynx is a very easy to use Web Browser for the UNIX system. The main differences between Lynx and other Web Browsers is that users cannot see pictures and they have to enter all the commands on the keyboard rather than using the mouse to point and click.

### b. Point-and-Click Graphical User Interface

Cello is a WWW browser that works on Microsoft Windows and allows people with a connection to the Internet.... to follow Hypertext (or Hypermedia) links to files and information services all over the world. It displays both regular text files and files that are written in HTML format and will translate different Internet services such as Gopher and News and FTP into a format that appear to the users as if it were a hypertext document (Bruce Atherton and Will Sadler 2000, p.2).

NCSA Mosaic was the first browser with the point-and-click graphical user interface. Mosaic has versions available for UNIX systems, Macs and Windows PCs, Amiga.

Netscape Communications and Microsoft Internet Explorer: During the past year Netscape and Microsoft have been tripping over each other in an attempt to get their "better" versions of the web browser out to the market. Netscape and Microsoft are currently trying to define a new WWW browser with their ideas about the direction of dynamic HTML and Push technology.

## C. New MarkUp Languages and Multimedia Design Software

### 1. XML

XML – the Extensible Markup Language, is the newest programming language that was developed by an XML Working Group (originally known as the SGML Editorial Review Board) formed under the auspices of the World Wide Web Consortium (W3C) in 1996. XML enables designers to create their own customized tags to provide functionality not available with HTML. In May 1999, the W3C announced that HTML 4.0 had been recast as an XML application called XHTML. This move will have a significant impact on the future of both XML and HTML. Some engineers believe XML will take over HTML within the next several years, and it will become the next generation of markup languages (Bosak and Bray 1999, p.3).

## 2. PHP 4.0.0

PHP is an open-source server-side scripting language designed by Zend Technologies (freely downloadable from php.net and zend.com) for creating dynamic Web pages for e-commerce and other Web applications. A dynamic Web page is a page that interacts with the user, so that each user visiting the page sees customized information. Dynamic Web applications are prevalent in commercial (e-commerce) sites, where the content displayed is generated from information accessed in a database or other external source (Zend Technology 2000, p.35).

> PHP is flexible server-side scripting language, which can operate on numerous platforms and various Web servers. It's fast and simplistic in its requirements, and powerful in its output. It's easy to learn even if end users only have the most basic understanding of programming language. PHP is today's fastest-growing technology for dynamic Web pages.

According to Netcraft's December 1999 Web survey, the number of Web sites using PHP passed the million mark. E-Soft Web survey of November 1999 indicates that PHP is used on 23% of Apache servers, making it by far the most popular scripting language on Apache servers (which constitutes 55% of the total number of Web servers). While the number of Web sites is growing at 6% a month, the number of Web sites using PHP is growing at a rate of 20% per month. With the open-source trend gaining popularity, PHP is expected to continue to pick up momentum (Netcraft, 1999).

PHP is a good solution for creating dynamic e-commerce sites because it needs short development time and fewer programmers to code. PHP code is significantly easier to

maintain and update than comparable Perl or ASP code. The new PHP 4.0 was released on May 20, 2000 and its introduction is expected to make PHP an even more powerful solution for dynamic Web development, by featuring an approximately 50-fold performance improvement and a wide variety of new features.

### 3. Dynamic HTML and Push Technology

Dynamic HTML (DHTML) as defined by the WWW Consortium is "the combination of HTML, style sheets and scripts that allows documents to be animated." The computer specialists and enthusiasts are creating DHTML that will allow programs to be embedded at various places. Dynamic HTML will allow web authors more flexibility and control by redefining certain WWW page elements as distinct HTML objects. This is done through object-model script languages that allow web authors to change the position of graphics, text and animation independently of one another, thus giving it the name Dynamic HTML.

Push technology is software that either 1) delivers information directly to viewers' desktops without having to go out on the web and search for it or 2) informs viewers when information has come out or has been updated, thus allowing users to go to a particular site.

The primary problems that Push technology might have is that since there are few standards for HTML, Netscape and Microsoft, two competing companies, are each developing their own Dynamic HTML. This puts the WWW at risk of being split into two versions—Microsoft WWW sites and Netscape WWW sites. As a result, WWW sites would have to offer two versions of their web sites, one for MS browsers and one for Netscape browsers. There are a few features of Dynamic HTML that both companies agree on, such as address layering, positioning and fonts. Their main differences are in the object model script

language and HTML extensions. Microsoft's object model script languages are Jscript (the MS version of JavaScript) and Visual Basic script (Vbscript). Netscape uses JavaScript. With primary problem, WWW authors will have to decide which company's Dynamic HTML extensions they will use on their web sites. If someone lands at their Netscape built site with a MS browser, it will not display correctly. In order to circumvent the problem, web authors will either have to tinker with their sites until a reasonable version can be displayed on both browsers, or they will have to build a site for the two kinds of browsers.

**4. Multimedia Web Design Software**

From Dreamweaver to Generator to Flash and Fireworks, Macromedia has seen its future in Web graphics and multimedia content. Dreamweaver enables users or designers to build sophisticated Web pages by using a mix of style sheets and DHTML (Dynamic HTML). Fireworks was one of the first Web graphic tools for creating and optimizing images for the Web. More recently, Macromedia released Generator, which can automatically generate personalized graphics. Generator produces graphics in a variety of formats and is useful for any images that draw on dynamic data, such as weather maps.

Flash 4 is the newest vector-based software designed for Web graphics and animation. Although Flash is facing competition from Adobe's PGML (Precision Graphic Markup Language), Flash has already been integrated into America Online, Netscape Communicator, and Windows 98. These advanced markup languages and design tools allow Web designers and average Web developers more freedom (Macromedia 2000, p.19). In October 1999, NPD Research, the parent company of MediaMetrix, conducted a study to determine what percentage of Web browsers have Flash pre-installed on their computers. The

results show that 88.3% of Web users can experience Flash content without having to download and install a player. Flash sites are consistently viewable across Macintosh, Windows, Solaris, Linux, and additional Web-appliance platforms. The Flash Player is the most widely distributed high-impact Web site viewer today (Macromedia 2000, p.23).

Adobe released its own professional Web graphics and animation software (LiveMotion) to compete with Macromedia Flash. LiveMotion is also a vector-based software for creating interactive Web graphics and animation. It also supports many raster effects such as distortion and 3D. This is an advantage to designers who at times want visually rich graphics that raster effects can provide. LiveMotion provides a familiar interface similar to Photoshop and Illustrator. It creates Web graphics using built-in vector drawing tools, such as the Adobe-standard pen tool and shape tools such as ellipse, rectangle, and polygon tools. Object-based timelines allow every object to be independently animated. Set key-frames independently animate each object attribute, including position, opacity, rotation, and more (Adobe.com 2000, p.29).

Adobe also released After Effects and Dynamic Media Collection for designing sophisticated motion graphics and visual effects for film, video, multimedia, and the Web. Its tight integration with Photoshop, Illustrator and Premiere is a convenience for designers to transfer and run between the software.

Besides Adobe and Macromedia, other software manufacturers all aim at this multimedia Web design market, For example, Ulead Systems released Gif Animator 3 specifically for creating compact animations with drag and drop features. Some manufacturers even produce animation-ready applications for users to copy and paste, such

as Animation Explosion by Nova Development, and Webtricity 2.0 by Micrografx (Amazon.com 200, p.10).

In this chapter, the author researched the development of WWW technology, mark-up languages and Web design software. Faster processor and modem, various Internet access, enhanced Web browser technology make more and more multimedia, animated Web sites to be able to view and post by Internet users and designers. New mark-up languages, such as XML, DHTML, and PHP, are designed to code multimedia and interactive Web designs. Software manufacturers aimed at the multimedia and animated Web design market, released software such as Flash, Golive, and Dreamweaver to fulfill the demands Web users and designers. From the trend of Web design software and Internet devices design, we can see the future of Web design tends to multimedia, interactive and animated design method.

# CHAPTER 3. THE DESIGN PRINCIPLES OF NON-ANIMATED WEB SITE

The majority of Web sites are non-animated Web sites in today's WWW. Non-animated Web design uses many design principles. Most of these principles are applicable to both animated Web design and non-animated Web design, such as the grid system, structure, simplicity, repetition, consistency, and visual hierarchy. Animated Web sites add more features than non-animated Web design, such as motion and sound. Principles such as three-dimensional spacing, linear or nonlinear motion paths are additional issues Web designers deal with when creating animated Web design.

## A. The Design Principles of the Non-Animated Web Site

Design principles are as important in Web design as they are in other graphic design fields. Applying design principles to the Web helps clarify the information the designer wants to communicate; it provides easy-to-use visual communication systems; it also defines the style or concept of both the designer and the client.

As mentioned before, non-animated Web designs look like publication designs. This is because most Web designers were publication designers before the Internet emerged. As a result, many Web designers still treat Web design the same way as they do publication design. For example, Web design has all the elements that a magazine has: cover, table of contents, index, title, body text, and so on. The front-page or entry page of a Web site can be seen as a cover page of a magazine. It provides the company or organization's most

important information as well as some representative images and hotlinks. The navigation system could be seen as table of contents. Unlike a book or a magazine that puts the table of contents on only the first page, the table of contents or the navigation system of a Web site has to be on every page. It is this feature of the Web site that provides users with a convenient way of navigating the site. The body text of a Web site has equal proportions of a magazine or a book.

We will discuss the design principles of this type of Web site in the following sections.

**1. Concept**

Concept is the essence of a site. Concept defines the philosophy, idea, and mission of the site host. The concept also defines the target end user group. Defining a concept for the site can help determine what will be the design style, information hierarchy, and even the page or site structure. There are few books available that discuss the topic of concept in Web design. Most books concentrate on the techniques of how to design beautiful and easy-to-use Web sites.

Determining a concept is the first decision a Web designer will face when he/she receives the task. Concepts vary from site to site. How does a concept differ from a commercial site that sells computer software to a site that sells fashion? How can viewers identify what kind of site they are in without looking at the title and body text? These questions can help determine what the concept will be and are questions designer must ask before beginning his/her Web design.

Developing a strong concept can help the designer form the style, structure, and overall layout of an entire site. The concept is the core to constructing a site differently from others. The first thing a Web designer needs to do is to discover the concept for the site, and then develop sketches or structures.

Two examples of how designers treat different design styles by developing a concept: Figure3-1 is pop music singer Jennifer Lopez's personal Web site, designed by Kioken; Figure3-2 is IDEO's homepage. The concepts differ at these two sites. Kioken, a newly emerged interactive Web design firm, has designed many sites for companies in the entertainment industry such as MTV, and Sony Music. According to Gene, CEO of Kioken Interactive Inc., they got the task of designing an attractive Web site for Jennifer Lopez. The target audience would be young music lovers and fans. They wanted to create a kind of musical aura with emphasis on the glamour of Jennifer Lopez. They decided the site "should move like a video on MTV and drive the user experience away from print and toward film" (McMillan 2000, p.132). Consequently, the designers combined typography with images as the theme of this site, creating an exciting, MTV-looking site. The concept of this MTV-looking site fits the taste of target audience, as it also shows the audience, the rhythm, style, and personality of Jennifer Lopez.

IDEO is a leading industrial design company that creates products, services and environments for companies. In the "About IDEO" page, they write, "Drawing on twenty years of experience in the field of innovation and design, IDEO defines and develops new futures for industry leaders and start-ups alike" (IDEO 2000, p.2). Based on their concept of designing for human factors and ergonomics, the site follows a straight grid system with indications, icons, and mouse rollovers to lead users browsing through the pages. Images,


**Figure 3-1. www.jenniferlopez.com**

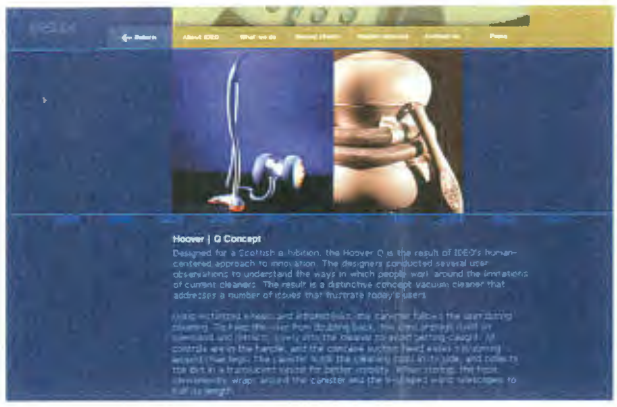


**Figure 3-2. www.ideo.com**

buttons, and texts are set to follow the grid it is easy for users to find information and navigate system through the site.

## 2. Structure and Grid System

In traditional graphic design, the definition of structure is to govern the positioning of forms in a design (Wong 1993, p.47). For Web design, structure not only means to govern the position of forms but also to subdivide any large body of information (Lynch and Horton 1999, p.18). The fundamental and crucial reason why we need to do this in Web design is that the human brain has limitations in holding and remembering information. In Patrick J. Lynch s book *Web Style Guide: Basic Design Principles for Creating Web Sites,* he points out, cognitive psychologists have known for decades that most people can only hold about four to seven discrete chunks of information in short-term memory (Lynch and Horton 1999, p.29). The goal of most organizational schemes is to keep the number of local variables the reader must keep in short-term memory to a minimum, by using a combination of graphic design and layout conventions along with editorial divisions of information in

discrete units (Lynch and Horton 1999, p.49). It is also suggested that small, discrete information units "are more functional and easier to navigate through than long, undifferentiated units" (Lynch and Horton 1999, p.22). The structure principle when applied to Web designs would function as an information and graphic divider.

Building a structure for a Web site is a matter of establishing a visual hierarchy for it. It is important to build a solid and logical organizational backbone for the site, structured in a hierarchy of importance and generality. In Web design, information management uses the tools of layout, typography, and illustration to lead the reader's eye through the page. Readers see pages first as large masses of shape and color, with foreground elements contrasted against the background field. They then begin to pick out specific information, such as graphics and headers, only after they start phrasing the "harder" medium of text and begin to read individual words and phrases.

Following are two examples of Web design which did not consider structural principles in their designs. The diagrams of these two sites show the inconsistency of Web structure (Fig. 3-5). These two Web sites are the finalists in NetStudio Corp.'s Mud Brick awards. The awards are given to the "worst of the Web" sites because they didn't follow the design principles of navigation, structure, and page layout. Angelfire.com (http://www.angelfire.com/me2/pineridgehabitat/index.html) (Fig. 3-3) and ICQ.com (http://www.mirabilis.com) (Fig. 3-4) are typical sites that lack site structure.

The examples below show how a design can cause difficulties in navigation and readability when it lacks a fundamental structural plan. A dull page of solid text (as shown in figure 3-4) will repel the eye because it is a mass of undifferentiated gray, and a page


**Figure 3-3. www.angelfire.com**

**Figure 3-4. www.mirabilis.com**

dominated by poorly designed or overly bold graphics or type (as shown in Figure 3-3) will also repel users who are looking for substantive content. Angelfire.com (Fig. 3-3) simply lists everything including site title, some sort of logo, link buttons, and graphics in the center. It not only causes reading problems because it's too long to navigate, it also confuses readers as to which part is important or where they should start.

ICQ.com, the world's largest on-line communication network (according to their own Web site) is a billion-dollar company that earned NetStudio Corp.'s Mud Brick first place award (Kane 1998, p.56). The site looks like it has a structure when first looked at it, but it has too much text, too many highlighted colors, and too many links that break the structure into many fragments (Fig. 3-4).

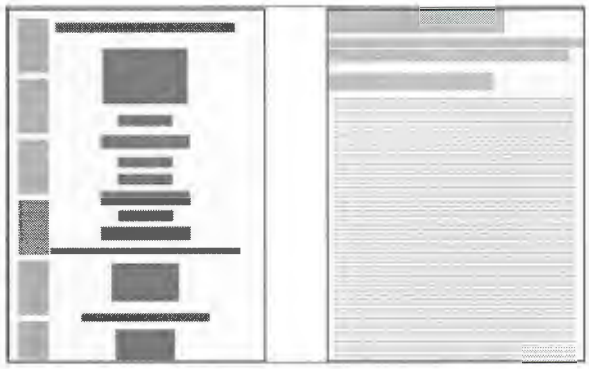

**Figure 3-5. Diagram of Web Structure.**

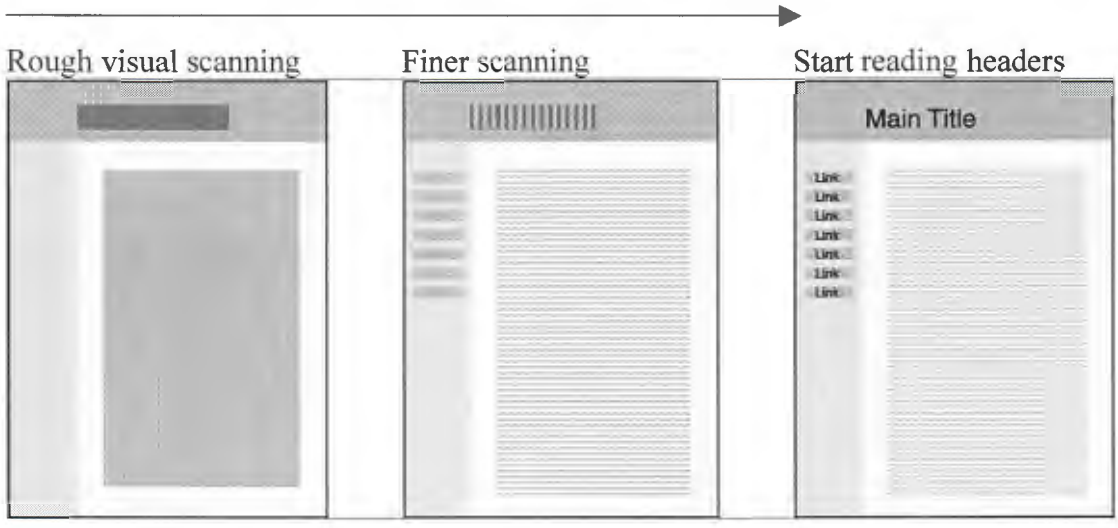


**Figure 3-6. Visual Scanning and Page Structure**

Here is an analysis of a reader's reading behavior from Patrick J. Lynch's book *Web Style Guide: Basic Design Principles for Creating Web Sites*, Page Design section (Fig. 3-6). In Western culture, readers of English read from left to right and from the top of the page to the bottom. This fundamental visual axis dominates most design decisions and is the basis for most print publication designers as well as Web designs. For publication design, the top of the page is always the most dominant place for important content, but for Web pages, the

upper page is especially important because the top four inches of the page is all that is visible on the typical 14 to 17 inch monitor. Therefore, to build a Web design structure the designer should follow human factors and rules of readability (Lynch and Horton 1999, p.97).

**3. Consistency and Simplicity**

Consistency in Web design means to carry through a consistent usage of color, imagery, typography, font and structure in one site no matter how many pages it has. Consistency gives polish to a site and encourages visitors to stay by establishing an expectation on the structure of a site. If this expectation fails due to inconsistent formatting, visitors will not have a comfortable experience and may not return. Therefore, at the start of the design process, the designer should make decisions on layout, color, font type, spacing and graphics. The designer should then work diligently to follow and maintain them throughout the design process. This is especially critical for large sites with numerous pages.

The consistency principle of Web design is: "You can change the entire look and feel of an application as long as you honor the user's previously learned interpretations and subconscious behaviors" (Tognazzini 1995, p.12).

Keeping consistency is not as easy as it appears to be. The designer decides where the site needs to be consistent and where the site can change. The Web site sends information to the user via text, graphics, sound and so on. The user sends back information by typing requests and comments or by clicking on interactive buttons via the keyboard and mouse. In both cases, the message receiver (site user) applies specific interpretations to the sender's message. If the system of the message sender (site creator) acts in a new way, receivers may be startled at first, but they will soon learn to interpret that new behavior. If the system uses

the same icon as the "enter" button on the first page but changes it to the "back" button on the rest of the pages, the message receiver will be confused due to the unexpected changes. Therefore, if designers want to make a change, they should make it obvious. As soon as a change becomes visible, people will soon adapt to this new interpretation, and will automatically expect it in the following pages.

Making the site design simple is the essential principle for all rules and standards. It is especially important in comprehensive Web design. From a physical and psychological view point, users are not impressed with complexity that seems gratuitous, especially users who may be depending on a site for timely and accurate work-related information (Lynch and Horton 1999, p.37). Few Web users spend time reading long passages of text on-screen. Most users will save long documents to disk or print them, rather than read extensive material online. The interface design of a Web site should be simple, familiar and logical to the audience.

Since the Internet is still in its infancy with limitations such as transfer speed, file size, graphic display and so on, designers have to make the site and page design simple. The more graphically intense a site, the longer it can take to download. The longer it takes to download, the higher the probability that the visitor will leave before it's done. On intranets, smaller file sizes can help make the system run faster and in less time. Performance means productivity. While modems are getting faster, most people on the Web are still connected at 28.8—and even then the Web does not always run at top speed.

**4. Information Hierarchy**

In Web design, hierarchy plays an important role in building a clear, effective information architecture. The World Wide Web is about information communication, and within this invisible cyberspace, designers organize visual necessities and navigation structures for the users. Web design needs hierarchy because most home page-and-link schemes depend on hierarchies, moving from the most general overview of the site (home page), down through submenus and content pages that become increasingly more specific. Figure 3-7 shows the diagram of "site hierarchy" used by Lynch and Horton from their book, *Web Style Guide: Basic Design Principles for Creating Web Sites.*

> Most users are familiar with hierarchical diagrams, and find metaphor easy to understand as a navigational aid. A hierarchical organization also imposes a useful discipline on one's own analytical approach to the content, as hierarchies only work well when one has thoroughly organized the material. Since hierarchical diagrams are so familiar in corporate and institutional life, users find it easy to build mental models of the sites (Lynch and Horton 1999, p.45).

**5. Repetition and Similarity**

A design contains a number of shapes, like circles, triangles and squares. Similar or identical shapes are "unit forms" that appear more than once in a design. Repetition is the same form or unit forms being used more than once in a design. Repetition helps unify the design and form an invisible structural grid (Wong 1993, p.78). We use repetition frequently

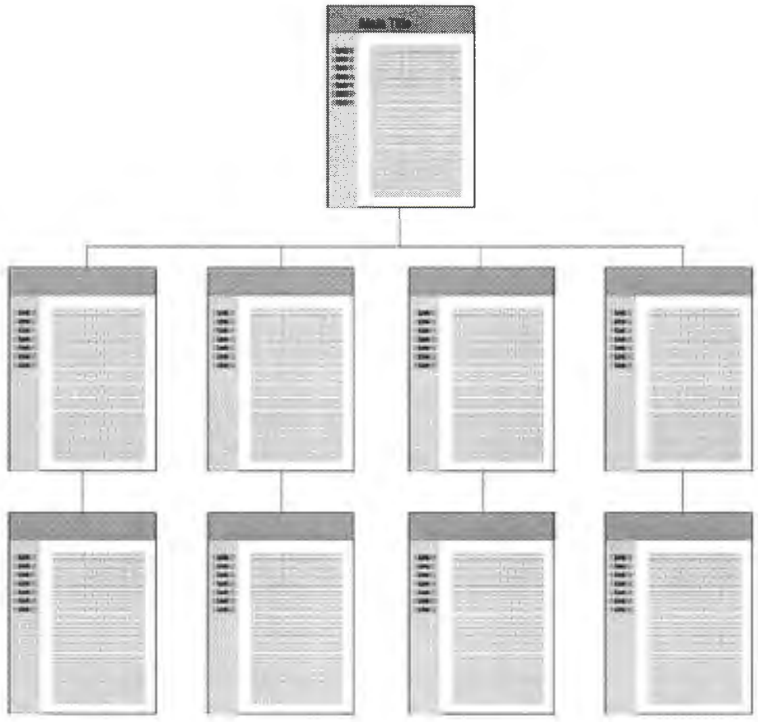

**Figure 3-7. The Site Hierarchy**

in both non-animated and animated Web design. Since a regular Web site contains many pages, repeating identity systems such as standard color and standard typeface is a way to maintain consistency. The simplest Web layout using repetition involves the arrangement of icons, logos, and graphics. Repetition gives the Web site a consistent graphic identity that reinforces a distinct sense of "place," and makes the Web site more memorable. A consistent approach to layout and navigation allows readers to quickly adapt to the design, and to confidently predict the location of informational and navigational controls across the pages of the site.

The Apple computer site (Fig. 3-8, Fig. 3-9) uses its distinct iMac colors and designs to set the graphic theme for the site. Note how the navigation system is carried through to all the interior banners. There is no confusion about which site the users is navigating through.

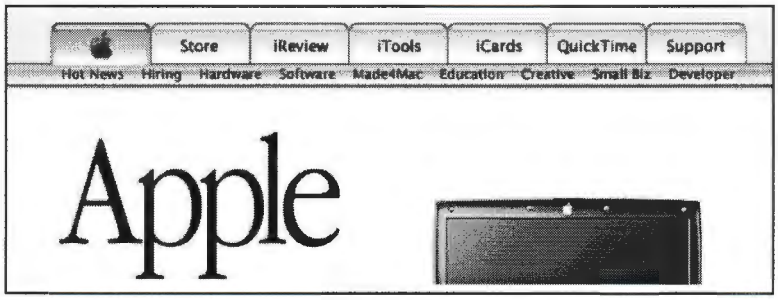


**Figure 3-8. www.apple.com Home Page**


**Figure 3-9. www.apple.com**

Wucius Wong, in *Principles of Form and Design* defines similarity: "Forms can resemble each other yet not be identical. If they are not identical, they are not in repetition. They are in similarity." When we see things that are similar, we naturally group them. Grouping by similarity occurs when we see similar shapes, sizes, colors, spatial locations, angles or values. Similarity is necessary before we can compare differences. Similarity also creates differences within a visual system.

Aspects of similarity can be easily found in Web design. For example, we can see that IDEO Web site (Fig. 3-10) uses similar rectangles to form the site. It is easy for viewers to identify different blocks of information. Not only do the similar rectangles give viewers a strong sense of a horizontal grid system, but this similarity also emphasizes the concept of the industrial design firm.

Similarity is also useful in Web icon design. We have seen many Web sites use similar icon designs to help guide viewers browsing through their Web site. Notice the navigation icons on Metadesign s home page banner (Fig. 3-11). With a similar design format, color and symbolic appearances, viewers will most likely remember and realize its functionality after they look through the first page.


**Figure 3-10. www.ideo.com**


**Figure 3-11. www.metadesign.com**

# CHAPTER 4. UNDERSTANDING WEB ANIMATION BY STUDYING TRADITIONAL ANIMATION PRINCIPLES

Animation encompasses everything from low-budget flip books to full-length Disney films. There are the Mickey Mouse, and Tom and Jerry cartoons we saw as children. There are also studio-based animations and independents, traditional 'toons', and experimental animations. Each of these types of animation has its own difficulties: budget and time constraints, technology limitations, and so on. None, however, share the unique challenges of Web animation. Web animators may not have to hand-paint every cell as did animations in the past, but bandwidth, platform, and browser issues make Web animation as challenging as other types of animation. When we speak of design, however, design principles are still the determinant factor in animated web design.

## A. Principles of Traditional Animation Applied to Web Design

### 1. Definition of Animation

One of the most famous definitions of animation comes from Norman McClaren, one of the medium's acknowledged masters who funded the animation department at the National Film Board of Canada. He says:

> Animation is not the art of drawings that move but the art of movements that are drawn; What happens between each frame is much more important than

what exists on each frame; Animation is therefore the art of manipulating the invisible interstices that lie between the frames.

As suggested in the above paragraph, McClaren is not defining the practice of animation, but rather its essence, which he suggests is the result of movement created by an artist's rendering of successive images in a somewhat intuitive manner.

## 2. Principles of Animation

In traditional animated film, animators searched for better methods of relating drawings to each other and by finding a few ways that seemed to produce predictable results. By continuing to practice those methods, the following have become the fundamental principles of animation (John Lasseter 1987, p.2):

1. Squash and Stretch—defining the rigidity and mass of an object by distorting its shape during an action;
2. Anticipation—the preparation for an action;
3. Staging—presentating an idea so that it is unmistakable clear;
4. Straight Ahead Action and Pose to Pose Action—the two contrasting approaches to the creation of movement;
5. Follow Through and Overlapping Action—the termination of an action and establishing its relationship to the next action;
6. Timing—spacing actions to define the weight and size of objects and the personality of characters;
7. Slow in and out—the spacing of the inbetween frames to achieve subtlety of timing and movement;

8. Arcs—the visual path of action for natural movement;

9. Exaggeration—accentuation the essence of an idea via the design and the action;

10. Secondary Action—the action of an object resulting from another action;

11. Appeal—creating a design or an action that the audience enjoys watching.

These principles have been practiced by animators for generations. In the new Internet generation, animators tend to have a more flexible style. Principles such as staging, timing, anticipation, appeal, follow-through and overlap, and exaggeration still apply in the same way for all types of animation, namely 2D hand-drawing animation, 3D computer animation and Web animation. The meaning of Squash and Stretch, Arcs, Slow in and out, Straight ahead action and pose-to-pose action are changing, however due to the difference in medium. For instance, in Web animation, Squash and Stretch would normally take more frames and timing to animate and render, making the file size so large it would take a long time to download. Also, Squash and Stretch tends to be a characteristic of Disney-type classic animations. Animators had a whole system of training programs in order to be skilled in these techniques in the early days. As the popularity of personal computers and accessibility of the Internet increases, people who do not have traditional animation training are now beginning to animate.

**a. Timing**

"Timing, or the speed of an action, is an important principle because it gives meaning to movement—the speed of an action defines how well the idea behind the action will read to an audience. It reflects the weight and size of an object, and can even carry emotional mean-

ing" (Lasseter 1987, p.4). The personalities are developed and defined more by their movements than their appearance. The varying speed of those movements determined whether the character was lethargic, excited, nervous, relaxed (Thomas and Johnston 1981, p.120).

Timing defines the weight of an object. Two objects with identical sizes and shapes could appear to be two different weights by manipulating the timing alone. A heavy object has greater mass so it is slower to accelerate and decelerate than a light one.

For example, a heavy cannonball must have a large force to move, but once it is moving, it will require some force to stop it. When dealing with heavy objects, animators need to give plenty of time and force to start, stop or change their movements, in order to make their weight look convincing. On the other hand, a light object tends to have less resistance to change of movement and so needs less time to start or stop moving. The following example shows two balls of identical size, shape and motion. The difference in timing can make these two balls appear to be of different weights. The numbers refer to key frames in sequence timing (Fig. 4-1).

Timing also can contribute greatly to the feeling of size or scale of an object or character. A heavy giant moves more slowly pace by pace, like the cannonballs, and takes more time to get started and more time to get stopped than a normal human. Conversely, a tiny character has less inertia than normal, so his/her movements tend to be quicker. "The way an object behaves on the screen, the effect of weight that it gives, depends entirely on the spacing of the poses and not on the poses themselves. No matter how well rendered a cannonball may be, it does not look like a cannonball if it does not behave like one when animated. The same applies to any object or character" (Whitaker and Halas 1981, p.2).

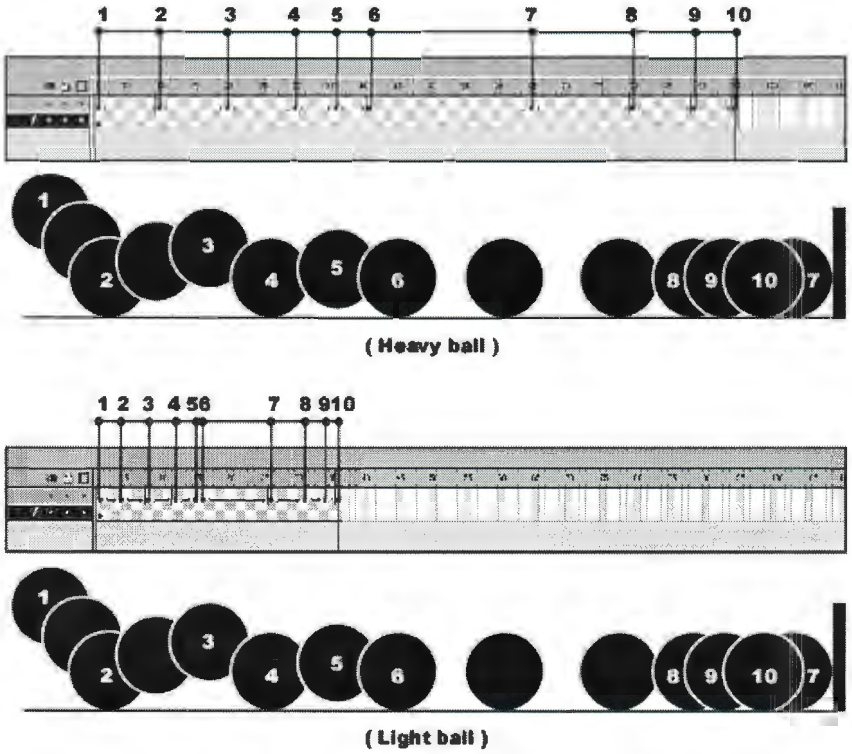


**Figure 4-1. Two Identical Balls with Different Timing**

Here is an example of how the changing of the timing of an action could give it new meaning by Thomas and Johnston. There are two separate drawings of a head. The first shows the head leaning toward the right shoulder and in the second drawing, the head is looking over the left shoulder and its chin slightly raised. These drawings can be made to communicate a multitude of ideas, depending entirely on the timing used. Each inbetween drawing added between these two "extremes" gives a new meaning to the action (Fig. 4-2).

| | |
|---|---|
| No inbetweens | The Character has been hit by a tremendous force. His head is nearly snapped off. |
| One inbetweens | The Character has been hit by a brick, rolling pin, frying pan. |

**Figure 4-2. Two Drawing of a Head**

| | |
|---|---|
| Two inbetweens | The Character has a nervous tic, a muscle spasm, an uncontrollable twitch. |
| Three inbetweens | The Character is dodging the brick, rolling pin, frying pan. |
| Four inbetweens | The Character is giving a crisp order, "Get going!" "Move it!" |
| Five inbetweens | The Character is more friendly, "Over here."“Come on-hurry!" |
| Six inbetweens | The Character sees a good-looking girl, or the sports car he has always wanted. |
| Seven inbetweens | The Character tries to get a better look at something. |
| Eight inbetweens | The Character searches for the peanut butter on the kitchen shelf. |
| Nine inbetweens | The Character appraises, considering thoughtfully. |
| Ten inbetweens | The Character stretches a sore muscle. |

**b. Staging**

"'Staging' is the most general of the principles because it covers so many areas and goes back so far in the theater. Its meaning, however, is very precise: it is the presentation of any idea so that it is completely and unmistakably clear. An action is staged so that it is understood; a personality is staged so that it is recognizable; an expression is staged so that it can be seen; a mood is staged so that it will affect the audience"
(Thomas and Johnston 1981, p.145).

In order to lead the eyes of the audience, the animator needs to stage an idea clearly, so that the audience understands what the animator wants to communicate. No matter if it is a motion dominant animation or a storytelling dominant animation, each scene will have to fit the plan, and every frame of the film must help to make this point of the story.

It is important that only one idea be seen by the audience at a time. "One of the most important rules of the theater: only do one thing at a time" (Thomas and Johnston 1981, p.128). The images shown in Figure 4-3 were scenes in *Sex Slave 5* by Naoki Mitsuse. The story shows that Sex Slave has been arrested by a policeman, and in the police car, the Sex Slave is telling where he was when the professor was murdered. Then something happens while they were driving. Notice how the staging changes while Naoki narrates the story. It is very clear for audiences to understand Sex Slave's arrest shown by one scene in police car. The change of staging from Sex Slave, to a highlighted circle, to the policeman clearly shows the conversation between Sex Slave and the policeman. While Sex Slave is talking, the policeman's actions are very subtle, so the attention of the audience is always on Sex Slave. If the policeman's reaction is important, the camera changes to the front, and focuses on his facial expressions and hand gestures. With Sex Slave's actions tones down, and the attention

**Figure 4-3. Staging**

of the audience transfers to the policeman. When another car approaches the police car, the staging changes from inside to outside.

We notice that there is only one action happening at once and the object of interest contrasts from the rest of the scene. In the still scene, the audience's eyes are attracted to movement, and vice versa. In a very busy scene, the eye will be attracted to something that is still. "Each idea or action must be staged in the strongest and the simplest way before going on to the next idea or action. The animator is saying, in effect, "'Look at this, now look at this, and now look at this'" (Thomas and Johnston 1981, p.146).

Another important idea of staging an action in silhouette was developed in the early days at Disney. Because all the animations were in black and white in those days, the arms, bodies or hands of the characters were all in black, so there was no way to stage an action if the arms were in front of the bodies, except in silhouette. Actually, this limitation demonstrated that it is always better to show an action in silhouette. In *Sex Slave 6,* when Sex Slave's father drove the flying car with him across the city's sky, it is hard to see what is happening because it is staged from a wide view (Fig. 4-4). If the car were flying in front of

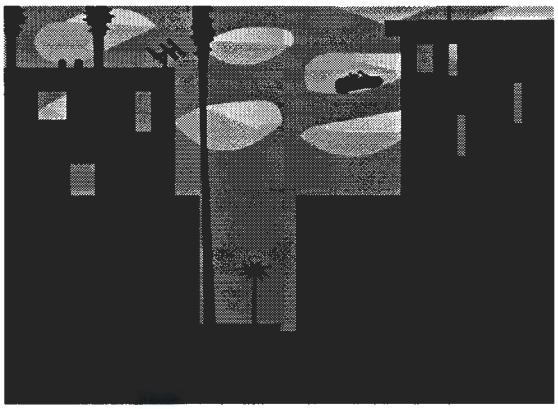

**Figure 4-4. Silhouette**

those building with colors, it would be difficult to see the action of the car. Viewing the action in silhouette is perfectly clear.

**c. Anticipation**

Anticipation is the preparation for the action. When an audience watches an animated scene, they are prepared for the next movement and expect it before it actually occurs. "This is achieved by preceding each major action with a specific move that anticipates for the audience what is about to happen" (Thomas and Johnston 1981, p.194).

Animated by Dave Jones, Sleep Elusive (Fig. 4-5) talks about a man who was very tired from his work, went home and found he could not sleep well because of the noise from next door.

This is the scene when he can not stand it any more and goes to find out what is going on next door. Before he reaches to grab the door handle, he first raises his arms as he stares at the door, broadcasting the fact that he is going to open the door with anger. The anticipatory moves may not show why he is doing something, but there is no question about what he is going to do next. Expecting that, the audience can now enjoy the way it is done. "This is the

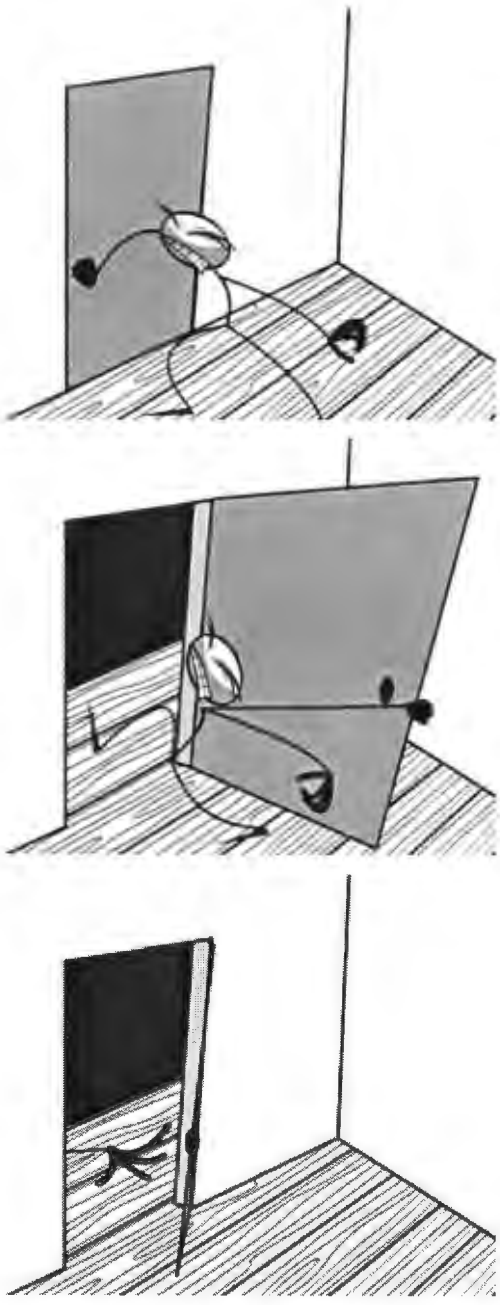

**Figure 4-5. Anticipation -1**

oldest device of the theater, for without it, the audience becomes nervous and restless and whispers, 'what's he doing?'" (Thomas and Johnston 1981, p.194).

Anticipation is also an important way to direct the attention of the audience to the correct part of the screen at the right moment (Lasseter 1987, p.8).

Using the same animation as an example, when the man leaves his room, the staging changes to the hallway and stays there for about five seconds, and then we see the angry man walk through the hallway and knock on his neighbor's door (Fig. 4-6). Because we know that he steps out of his apartment before the staging change to the hallway, we know he will pass by our view. This is important because it prevents the audience from missing vital actions. If the audience expects something to happen, then the scene can be much faster without losing them. If they are not properly prepared for

**Figure 4-6. Anticipation -2**

very fast action, the audience may miss it completely; the anticipation must be made larger or the action slower (Whitaker and Halas 1981, p.34).

### d. Following Through and Overlapping Action

Following through is the termination of an action (Lasseter 1987, p.5). In the early days, when an action reached the end, the character often came to a sudden and complete stop. That was not the natural way to a complete an action. In general, actions are gradually carried past their termination point. For example, a leg kicks a football and after the leg reaches the releasing point, the leg will continue past the point. Following through or Overlapping action has five main categories (Thomas and Johnston 1981, p.187):

1. Appendages or loose parts of a character or object continue to move after the rest of the figure has stopped. The movement of appendages like a big coat or the flesh on cheeks will be slower than the leading part of the figure. So, as the leading part of figure slows to a stop, these appendages will continue to move and will take longer to settle down. The movement of those appendages will have the correct feeling of weight if it is carefully timed. The heavier the appendages, the farther behind they drag and the longer they will take to

settle to a stop. By contrast, the lighter the appendages, the less drag they will have and they will stop more quickly.

2. The movement of every part of an object or a figure does not move all at once, but instead, some parts must lead the action, like the engine of a train. Walking is an example since the action starts with the hips. As the hip swings forward, it sets a leg in motion, and then the as hips leads, the other leg follows. As the hip twists, the torso follows, then the shoulder, the arm, the wrist, and finally the figures. Therefore, as one part arrives at the stopping point, others may still be in movement; an arm or hand may continue its action even after the body is in its pose (Thomas and Johnston 1981, p.189).

3. The rate of following through is different depending on the materials and masses of the appendages. For instance, the flesh on one figure's cheeks is lighter than another's heavy coat. Consequently, the flesh dragged behind would be slower than that of the coat. Therefore, the heavier the material and mass is, the further behind the main action with a lot of squash and stretch. Many comic actions have been based on this principle. In Disney animation, we can see many scenes like the fat on a running character dragging farther and farther behind, until the ultimate occurs: the skeleton runs off, leaving the flesh to fend for itself (Thomas and Johnston 1981, p.189).

4. The overlapping action tells us more about the charactor than the drawing of the movement itself with the way the action is completed. That means the action may only takes a few seconds, but what happens after the action can easily take five feet of film and is much more revealing.

5. Overlapping action makes the object seem natural and the action more interesting. Sometimes the overlapping may only be one or two frames apart, or sometime the action

would go by so fast, the audience would not even see these slight variations, but it makes the action as a whole more interesting. More importantly, overlapping is critical to conveying the main idea of the story. An action should never be brought to a complete stop before starting another action. Overlapping maintains a continual flow and continuity between whole phrases of actions (Lasseter 1987, p.6).

**e. Straight Ahead Action and Pose-to-Pose Action (Keyframes)**

There are two types of animation. Straight Ahead action means the animator literally works straight ahead from his first drawing in the scene. Working with this kind of animation, the animator knows where the scene fits in the story. The animator would simply complete one drawing after another, getting new ideas as he goes along, until he reaches the end of the scene. This process creates drawings and action that have a fresh and slightly zany look, because the animator keeps very creative in the whole process. Straight ahead action is used for wild actions where spontaneity is required.

Pose-to-pose means that the animator plans his actions, figures out what drawings will be needed to animate the business, and makes the drawings, focusing on the poses, relating them to each other in size and action, and then draws the inbetweens. With pose-to-pose action, animators could spend more time to improve the key drawing and exercise greater control over the movement. Pose-to pose action is used for animation that requires good acting, where the pose and timing are all important.

For Web animation, animators usually use computers to generate the whole process. The Pose-to-pose action applies to keyframe computer animation with timing and pose control of extremes and inbetweens. Animators use software like Adobe Illustrator,

Macromedia FreeHand, or CorelDraw (vector-based programs) to create 2D extremes, and then use software like Macromedia Flash, Adobe Golive and so on to automatically generate the inbetweens. For instance, an object moves from one corner (keyframe 1) to the other (keyframe 2). Then tweening fills in the frames in between the keyframes, so that the object appears to move gracefully across the screen. Tweening also can articulate changes in scale, position, color, rotation, and shape. The traditional animators would hand-draw the same image in a slightly different position for every new frame. Tweening is the fastest and easiest way to animate an object, and it makes file sizes smaller. Also, scripting languages such as JavaScript, Macromedia's Director Lingo or even Flash's script can generate many animations like mouse rollover and clicks.

**f. Slow In and Out**

Slow in and out deals with the spacing of the inbetween drawings between the extreme poses. Mathematically, the term refers to second-and third-order continuity of motion (Lasseter 1987, p.7).

In early animation, the actions was either fast or slow moves, the spacing from one frame to the next one was fairly even. Later on, when pose-to-pose action became more expressive, animators wanted the audience to see them. They found that by putting the inbetweens close to each extreme, with only one fleeting drawing halfway between, they could achieve a very spirited result, with the character zipping from one attitude to another. "Slowing out" of one pose, then "slowing in" to the next pose simply refers to the timing of the inbetweens (Fig. 4-7).

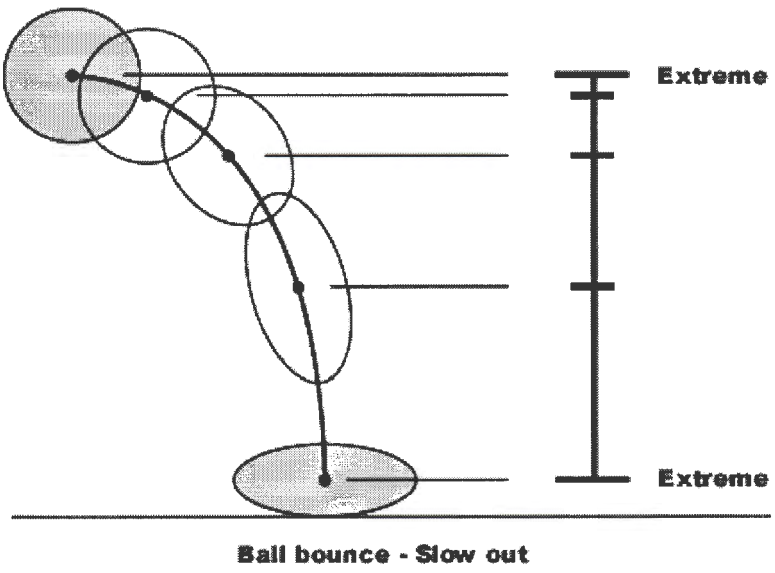


**Figure 4-7. Slow In and Out-1**

In most Web animation, the inbetweening is done automatically using tweening. Slow in and slow out is achieved by adjusting the spacing between keyframes. The tweening function in Flash can have motion and shape tweening. Motion tweening means you can have two extremes but different positions, then the computer will automatically generate the frames inbetween these two extremes. Like the timeline below, the arrows between two dots are motion tweenings. Shape tweening means two different objects with two different shapes can be automatically tweening in Flash (Fig. 4-8).

Slow in and out could achieve a more natural action, but too much of this gave a mechanical feel to the action, robbing the scene of the very life that was being sought, but it was still an important discovery that became the basis for later refinements in timing and staging.

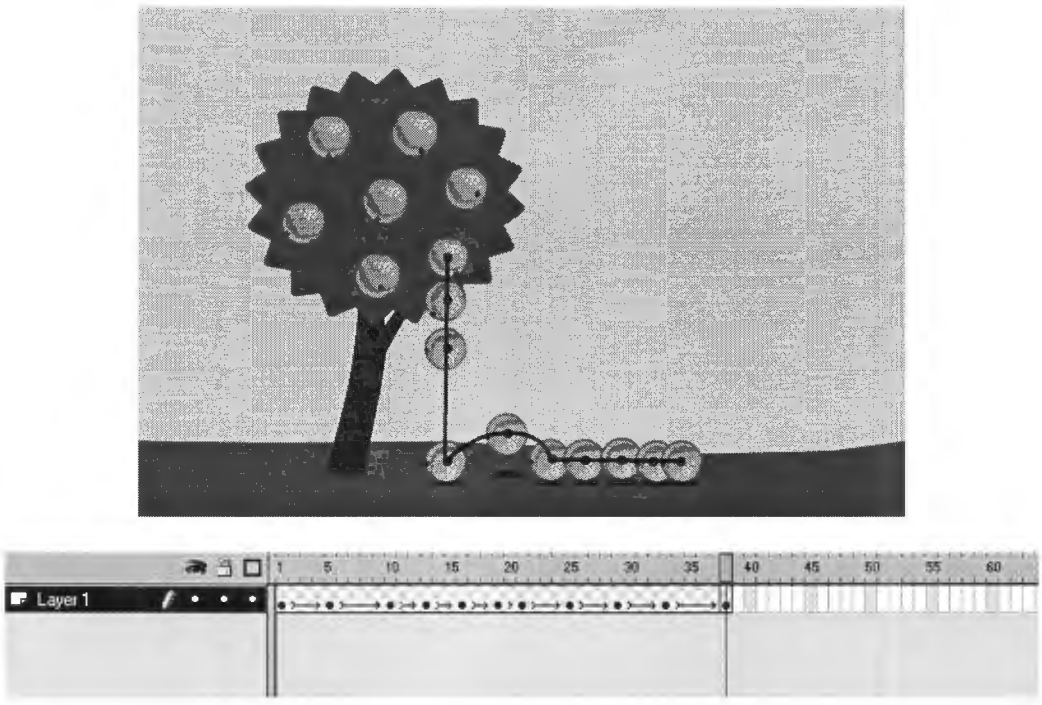


**Figure 4-8. Slow In and Out-2**

### g. Exaggeration

Exaggeration does not mean arbitrarily distorting shapes or objects or making an action more violent or unrealistic. However, exaggeration means the animator needs to really study the character and understand what the story, personality and emotion is about. After the animator understands what the reason is for the action, the audience will also understand it. If a character is sad, the animator will make him sadder; if he is bright, the animator will make him shine; worried, more worried.

Exaggeration can work with any component of a scene, such as sound, motion, shape, color, or design, though not in isolation. The exaggeration should be balanced in the scene. If only one thing is exaggerated, it will stick out and seem unrealistic. However, exaggerating everything in a scene can be equally unrealistic to the audience. If there is an element that the


**Figure 4-9. Exaggeration**

audience can recognize, then that becomes the ground for comparison of the exaggeration of the other elements, and will feel the whole scene is natural and realistic. An example of exaggeration is shown in the above scene in *The Bus Stop* by Joe Corrao (Fig. 4-9).

All the components of the scene, some natural, some exaggerated, worked together to make it believable and realistic. The background scene was based on the real scene of a street, a very normal and common street scene. When the character saw a UFO on top of his head, he was stunned and scared, represented by his eyeballs and tongue popping out. Despite the realistic scene of the background, the audience feels the exaggeration communicates a more precise atmosphere.

**h. Secondary Action**

Secondary action is an action that results directly from another action, such as a sad figure wiping a tear as he turns away or someone stunned shaking his head as he gets to his feet. Secondary actions are important in heightening interest and adding a realistic complexity to the animation. A secondary action is always kept subordinate to the primary

action. If the secondary action becomes more interesting or dominates in any way, it is either the wrong choice or is staged improperly (Thomas and Johnston 1981, p.194).

In *The Dream* by DC Roberts (Fig. 4-10), superman's cloak dragging behind his body is a secondary action because this movement is a direct result of the main action, the movement of his body. The secondary action can make the whole action more natural and realistic.

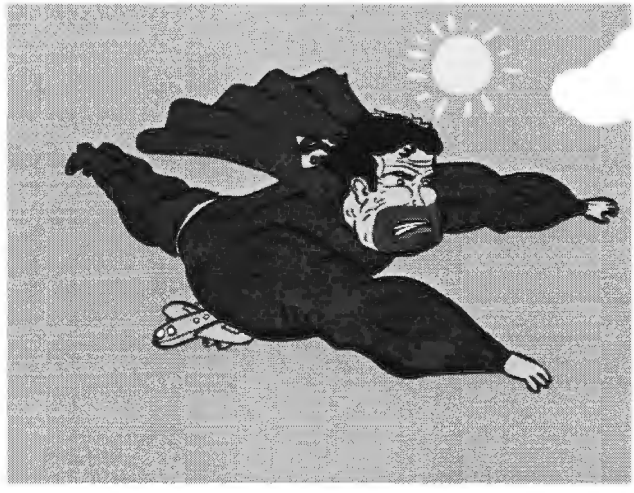

**Figure 4-10. Secondary Action**

The facial expressions of a character sometimes become the secondary action. When the main idea of an action is being told in the movement of the body, the facial expression becomes subordinate to the main idea. If this expression is going to animate or change, the danger is not that the expression will dominate the scene, but that is will never be seen. The change must come before, or after, the movement. A change in the middle of a major move will go unnoticed, and intended value will be lost. (Lasseter 1987, p.7).

### i. Appeal

Appeal means anything that a person likes to see: a quality of charm, pleasing design, simplicity, communication, or magnetism. Many aspects can make an animation lack appeal. For instance, a weak drawing or design, a complicated design, a hard to read design, or clumsy shapes and awkward movements all have low appeal.

Appeal can be achieved in many different ways: in designing the characters, in creating the pose, and in designing the actions. When creating an appealing pose for a character, one thing to avoid is called "twins," where both arms and both legs are in the same position, doing the same thing. This gives the pose a stiff, wooden, unappealing quality.

### j. Lighting

Lighting helps set the mood of an animation—change the lighting and suddenly the perception of the illuminated object alters. The light source and its direction, as well as the color and intensity of the light all play an important part in this perception. Sunlight, for instance, gives a scene quite a different feel than fluorescent light.

The light source is also a contributing factor. Animators should pay special attention to the direction the light is coming from. Light from behind or in front will flatten an object. Light from above or to the side will highlight form and give the appearance of normality since this is how light usually plays our environment. Whereas light from below could give everything a dramatic or bizarre feel.

Take notice of shadows, both cast or attached to the object. Shadows should be used to spice up a background, hint at a setting or specific location, indicate the time of day or season (winter light differs from summer light), or give everything an added sense of drama.

**k. Sound**

Sound is such an important element in animation that it can be discussed separately in a whole chapter. Since this thesis topic is more focused on visual elements in Web animation, sound will be discussed in the principle section as a supportive element in Web animation. The kind of sound an animator chooses is very important. Sound can add realism to a situation or take it away. It can also create mood, setting, or pacing. Sound can have a great influence on the visual effects. An action with the right sound effects can make an audience believe that he/she is in that situation. Choosing the wrong sound for the animation can confuse the audience.

There are three kinds of sound to use: soundtrack/background/atmosphere, character voices, and sound effects.

Background sound sets the tone of the animation. In film, sound is used to manipulate the audience's emotions. For example, when people watch a horror film, the ominous soundtrack makes people want to warn the characters about the danger they are facing. In cases like these, sound functions like an icon: A particular kind of music signals the audience of an intense situation's existence.

The correct voice for a specific character can make or break an animation.

> Imagine if Pat Sajak had been hired to speak for Beavis or Butt-head, or if Jesse Helms were the voice behind Cartman from *South Park* (well, that might be pretty funny, actually). The voice becomes the character, and if the voice changes, everything else changes with it. That's why the cast of *The Simpsons* can demand - and get—US $50,000 per episode. Though this fee is outrageously high for voiceover

work, the show just wouldn't be the same if the voices changed even slightly (McMillan and Hobson 1999, p.69).

Sound effects add realism and depth to animation, making the actions and the setting far more believable. Animators do not have to record the exact sound that they're trying to portray. Normally, sound effects specialists will fake it, which are often more believable than the real thing and much easier.

## B. An Overview of Animated Web Design

There is a common misconception of online animation. Many people think it is comprised of animated GIFs or AD banners or animated logos. Right now, there are many types of Web animation. For instance, GIF 89 animation uses GIF images to compose small-sized animations on the Web. Flash animation uses software to draw single frames or edits animation. Animated Web includes two major types of design. A Web site that uses Flash to create a splash or intro page, provides interactive links for users to browse through, is called Web motion design. This kind of site is designed with the purpose of information communicating, and, instead of being static, elements move. Motion design is not used exclusively in interface design, however. For example, the sequences seen before movies are also considered to be motion design, although there are not many animations.

The other type of animated Web design is called Web 'toons.' This type of site is designed with full animation to tell a story. Animators do not use animation to present a long textual article, but instead replace it with animation. There must be a distinct line between animation and motion design. Table 4-1 to Table 4-7 shows different types of animation have different advantages and disadvantages.

## 1. The Development of Web Animation

Web animation started with a technology called Server-Push. Server-Push was a well-designed technology for the servers that would push out JPEG or GIF images one at a time. This technology pushed the entire file out of the browser and kept the connection open to push out another one. At that time, people were desperate for motion on the Web because everything was so still. The World Wide Web quickly evolved server to server technology. Animated GIF was released in 1989. Once Animated GIF was released, an engineer in Sweden created GIF Builder that allowed anyone to create animation very much like a traditional cell-based animation. Therefore, instead of what Server-Push would send out, GIF 89 had the effect to send only the differences between the frames. One could animate only a small part of animation and leave the background attached (Cursor and McMillan 2000, p.78).

Bandwidth is probably the biggest issue for Web animation when dealing with sound. Sound could cause a small Flash file up to increase to several Megs when put on line, which might alienate a large portion of the audience because it will take a long time to download. One way to reduce the file size is to repeat or reuse sounds. Another way is to use CODECs (compression/decompression algorithms) to compress audio files for sending them over the Internet to a user's computer. The file then is uncompressed when played back on user's computer. There is a popular CODEC known as MPEG-2 player III, or MP3 for short animation. Microsoft's NetShow and Sun supports MP3 make it possible to get CD-quality audio with a compression rate of 1 to 12.

**Table 4-1. The media of animated Web design-GIF 89**

| | |
|---|---|
| Support: | Netscape 2+<br>MSIE 3+ |
| Tools: | GifBuilder<br>GifConstruction Set<br>GifMation<br>Adobe ImageReady<br>Macromedia Fireworks |
| Advantages: | Simple, easy to understand and create<br>Widely supported<br>Easy to integrate (no plug-ins required)<br>Free or cheap creation software<br>Good alternative image for plug-in animation<br>Supports transparent animations |
| Disadvantages: | File size limitations<br>Content limitations<br>Disjointed playback at different connection speeds<br>No sound |

**Table 4-2. The media of animated Web design-QuickTime**

| | |
|---|---|
| Tools: | Need a variety of video editing tools, including:<br>Adobe Premier<br>Adobe AfterEffects<br>Media 100 software<br>Flatten Mov |
| Advantages: | High frame rate<br>Straight-from-video conversion<br>Smooth playback at any connection speed<br>Multiple forms of compression for different styles<br>Streaming enables the use of large file sizes<br>Sound |
| Disadvantages: | Initial hefty download time<br>Limited to QuickTime window<br>May be forced to spawn new window in older browsers<br>Older browsers may require a plug-in<br>Not transparent |

**Table 4-3. The media of animated Web design-Shockwave**

| | |
|---|---|
| Support: | Netscape 2+<br>MSIE 3+<br>plug-in required, no Unix support |
| Tools: | Macromedia Director<br>Macromedia AfterShock |
| Advantages: | Streaming now available<br>Works well with Flash (can embed)<br>Sound<br>Interactivity |
| Disadvantages: | Plug-in required<br>Non-Web native technology<br>Limited to Shockwave window<br>Not transparent |

**Table 4-4. The media of animated Web design-Flash**

| | |
|---|---|
| Support: | Netscape 2+<br>MSIE 3+ (ActiveX controls, WIN)<br>Plug-in required |
| Tools: | Macromedia Flash<br>Macromedia AfterShock<br>May also want Illustration tools including:<br>Macromedia Fireworks<br>Macromedia Freehand<br>Adobe Illustrator |
| Advantages: | Streaming, so short wait for initial play<br>Ability to zoom in<br>High frame rate<br>Windowless<br>Supports transparent animations (recent versions)<br>Supports keyframe animation and tweening<br>Supports cell-based (frame by frame) animation<br>Easy to learn and create impressive motion graphics<br>Native support from Netscape 5 (no plug-ins required)<br>Sound<br>Interactivity |
| Disadvantages: | Plug-in required (unless user is running Netscape 5)<br>Vector-based imagery limits style choices<br>Less programmable then Shockwave<br>Older versions not transparent |

**Table 4-5. The media of animated Web design-Java**

| | |
|---|---|
| Support: | To enable Java at startup:<br>Netscape 3+<br>MSIE 3+<br>To start Java engine upon connection with applet:<br>Netscape 4+<br>MSIE 4+ |
| Tools: | Macromedia Director (Enliven)<br>Enliven Client (Enliven)<br>Macromedia AfterShock |
| Advantages: | Streaming (Enliven)<br>Conversion from Director/Flash available<br>Conversion from AfterShock<br>No plug-in required<br>Small file size<br>Sound<br>Interactive |
| Disadvantages: | Delay for 4.0 browsers (especially with Netscape) when Java engine launches<br>Programming intensive<br>Client-side CPU intensive |

**Table 4-6. The media of animated Web design- Dynamic HTML**

| | |
|---|---|
| Support: | Netscape 4+<br>MSIE 4+<br>(features differ between platform and browser) |
| Tools: | Macromedia Dreamweaver (WYSIWYG)<br>HTML editors |
| Advantages: | No plug-in required<br>No software required - you just need a text editor<br>Utilizes entire browser<br>Web native (uses HTML elements - type and forms - therefore, it's searchable and printable)<br>Quick downloads<br>Sound<br>Interactivity |
| Disadvantages: | Tends toward poor frame- and redraw-rate<br>Poor cross-platform compatibility<br>Not as robust an animation media as others (Flash and QuickTime) |

**Table 4-7. Multipurpose Internet Mail Extensions types supported**

| MIME types supported | | |
|---|---|---|
| | Netscape 3.0 | I.E. 3.0 |
| **AIF** | | X |
| **AIFC** | | X |
| **AIFF** | X | X |
| **AU** | X | X |
| **MIDI** | X | |
| **SND** | | X |
| **WAV** | X | X |

**2. Different Types of Web Animation**

It was the explosion of movement and animation that changed the way we view Web pages. One of the problems with GIF 89 is that it was only concerned with images and designers could not add sound or any kind of interactivity to it. Web designers could not do very simple things that most animation programs can do such as make the character sprits or make it run. Designers would spend enormous amounts of time setting up stories, themes and still images, creating a concern about large file sizes of GIF 89 animation. Designers have to make the image size small in order for it to run on the Internet.

HTML, DHTML, and JavaScript types of animation are hard to program artistic motion type of things because both HTML and JavaScript have a core mark-up language, which is really focused on text documents and expressing textual content. Things like images and application aspects were inserted later and so the support is not really geared towards that. For this reason, to do animation or movement or any kind of storytelling that goes beyond textual storytelling in HTML, designers have to build all of the extensions themselves. Whether it is writing JavaScript libraries for the animation, or simply

discovering how to get things to move, designers have to lay a lot of ground work just to tell a simple story.

Unlike HTML, DHTML, and JavaScript markup languages, Flash, Director, and QuickTime are built for presenting more visual content and more presentational-oriented content. This allows designers to focus more on storytelling or the presentation, instead of worrying about basic things like positioning objects left and top or getting things animated over time. Designers can focus on telling a story and thereby have more control of the software. We can see why more Web sites are built out of animation formats now just as old Web sites were built out of basic mark-up language.

Designers can express different types of stories by using sound and motion and interactions. Flash Web sites are well designed and easy to use for both designers and users. However, there is one problem when collaborating with others. For instance, building a Flash site is easier for designers because they have a lot more control of the program. For copywriters, however, checking all the text is difficult because if they do not have the word program running or have not been trained, then they cannot treat it like a text file. Some Flash users have pointed out that a program like Aftershock (another tool used to develop animated Web sites), allows those problems to be addressed. Therefore, if designers run Flash programs through Aftershock and create Web pages for it, Aftershock will publish all the textual content in Flash movies as comment text in the page and it will also print any links that are embedded in Flash movies.

Animators had not really started to look into Web animation before the publication of software such as Flash, Dreamweaver, or Generator. They mainly used short clips of animations for off-line TV or film cartoons. Graphic designers, editors, and animators had to

learn to approach the Web from off-line disciplines, and to be concerned with bandwidth and accessibility. Even though more and more users are getting DSL or Cable modems, designers and animators still have a bottle-neck in terms of bandwidth.

# CHAPTER 5. A COMPARISON OF NON-ANIMATED WEB DESIGN WITH ANIMATED WEB DESIGN

## A. Critiques of Existing Web Sites

### 1. Methodology

In Chapters 3 and 4, the author analyzed the design principles of non-animated and animated Web sites. Based on the research in these two chapters, we can see that knowledge of basic non-animated Web design principles is necessary in order for a Web designer to build a successful Web site. The basic Web design principles applied in static Web design, also perform fundamental roles in animated Web design. Animation enhances static Web design and adds new features to it. At the same time, animation extends the communication language of static Web design.

The following discussion will compare some existing Web designs, based on the design principles of both static and animated Web design the author studied in chapters 3 and 4. An analysis of an experimental static and animated Web design will also be addressed below. The discussion of the designed site is based on the browser Internet Explore 5 on a PC computer with a 17 inch monitor at 1280 X 1024 screen resolution setting.

## 2. Evaluation Criteria

Based on the literature review and research, and examining the effectiveness of a Web design, the most basic information communication methods are information hierarchy, text legibility, functional image, and site usability. Based on the above four categories, the author will analyze the definition of those terms as they relate to non-animated and animated Web design.

## 3. Information Hierarchies

Information hierarchies of a Web site can be defined by site structure design and page design.

### a. Site Structure Design

#### *i. Non-animated Web Site*

A static Web site organizes its information through a linear structure, like most publication designs, which groups messages in a linear order. Information that naturally presents a linear narrative, time line, or in a logical order is ideal for sequential treatment. In static Web sites, this linear structure is displayed once the site has been opened. The homepage should have the structure design available to users by providing hyperlinks, sub-links, and navigation buttons on the first page. Although, more complex Web sites may still be organized as a linear sequence, each page in the main sequence may have one or more pages of digressions, and parenthetic information. This may cause trouble for users looking for the main structure of the site. In this case, users could become confused.

In static Web sites, users control the way pages are browsed. Ninety percent of Web users do not browse Web sites by the order provided in the navigation bar or hyperlink area, according to NUA Internet Survey, 1999. Users tend to first find out what is the most important or interesting information to them, and then go directly to those pages. Therefore, in this case, information hierarchy that is defined by the designers might have no effect on the users.

***ii. Animated Web Site***

Animated Web sites have a nonlinear, dynamic site structure. The site structure cannot be seen all at once. It is built up in a timing sequence. This timing sequence is the best way to determine information hierarchies. Several contrasts can be employed to represent site structures. Fast or slow, before or after, static and dynamic, in and out have been often used in Web animation. For example, designers can set important information slower, or even stop it before the next scene appears.

Animated Web sites are more designer-oriented, which means designers controls the navigation process, providing the existing information sequence in a timely order. Users only need to sit back and watch the information go through by itself. In this case, users do not have to browse the information by themselves, thereby reducing the risk of being lost in hyperspace. Moreover, designers have no trouble sending all the information to viewers. For example, an animated Web site called Unimark (Fig. 5-1), which was designed by EYE4U.com, introduced timing into their navigation system making the sequence clearer and more effective. The links popped out following a timing sequence, clearly showed the

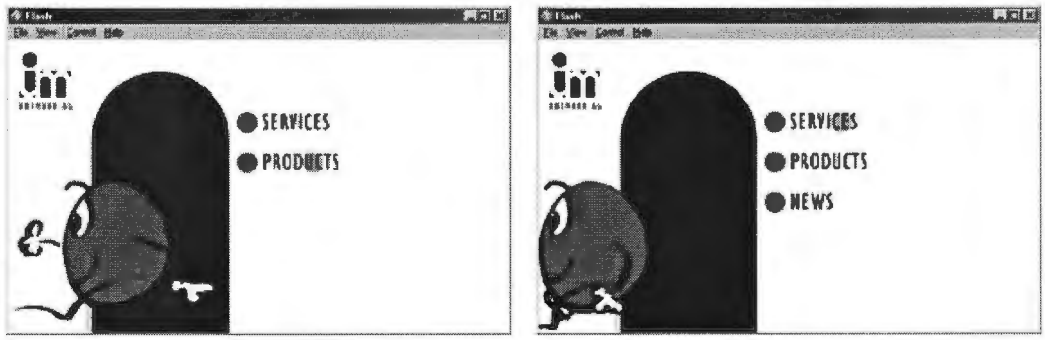


**Figure 5-1. The Information Structure of Unimark.com**

hierarchy of those links to the viewer. By knowing the intention of the designer, viewers will be less likely to confuse the information hierarchies.

### b. Page Design

#### *i. Non-animated Web Site*

Web designers use contrasting typefaces sizes, fonts, shapes, and position to define information hierarchies. Designers also use color-coding, and graphic consistency to define information hierarchies. Different typefaces, bigger sizes, bold faces or italics can stand out from the rest of the text. Color-coding is an important method to group and define information hierarchies in static Web design.

A representative static Web site, Graphis.com is a good example of using these methods to define information hierarchies in page design (Fig. 5-2). The site includes four main sub-links: magazine, books, call for entries and order page. Each link uses a color to represent its category. San serif and serif typefaces as well as type size is used for the title and sub-titles. The page has been divided into three major parts (Fig. 5-3). At the left is the navigation area for each category; at the bottom are the main sub-links; on the right hand side

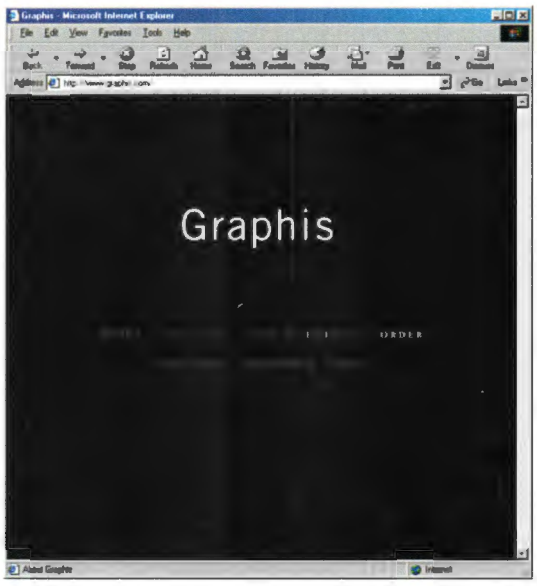


**Figure 5-2. Graphis.com Home Page**


**Figure 5-3. Graphis.com-Magazine**

is the content area; the upper side is for each category s title. This is a clear and simple non-animated Web page design that follows the design principles.

***ii. Animated Web Site***

Animation, on the other hand, adds new languages to Web page design. When design elements are in motion, then positions, shapes, sizes, colors, spaces and texts are in a changing status. This feature can be a very strong language in terms of building visual hierarchies. For example, in the info & contact page of eye4u.com (Fig. 5-4), after one click on the info&contact button, the shapes, texts, spaces, and colors start to animate. The changes increase text readability and help users understand the hierarchy of different information levels.

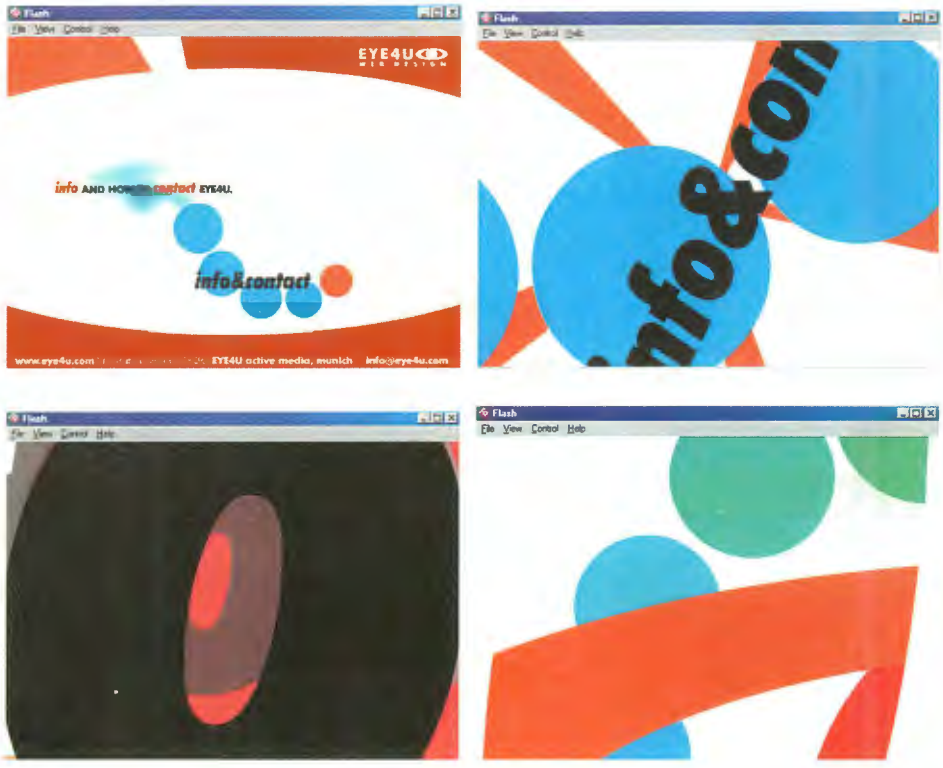


**Figure 5-4. Eye4u.com Homepage-Info. & Contact**

### 4. Text Legibility

Text legibility refers to whether a short burst of text such as a headline, catalog listing, or stop sign is instantly recognizable (Willians 1996, p.33). Text legibility can be increased or decreased in several ways: san serif vs. serif typeface, uppercase vs. lowercase, bold and italic vs. plain text, point size and alignment.

#### a. Non-animated Web Site

Static Web design usually fills the majority of page space with text content. Based on most people s reading habits, the content is often placed on the right side of the page. Designers often set san serif typefaces for titles and labels because these are easy to read on a

72 dpi screen resolution. In order to make the titles and labels easy to recognize, designers often combine uppercase and lowercase in one word. The use of italic typefaces is discouraged in hypertext because of its low readability on the screen. Static Web design requires the type size to be no smaller than 12 points in the titles and labels, and no smaller than 10 points in content text with at least 2 points larger than the type size added to create interline spacing (leading). These criteria help designers build an easy-to-read static Web site, but at the same time, it sets up many limitations for designers.

Designers may be concerned about the legibility and readability at the designing stage, but the preference settings on end users' computer system varies on font face, size and color, etc. Many readers feel uncomfortable reading page after page of chunks of text on the screen and will print out the Web pages so that they can be read more easily. Also, large chunks of text easily lose viewers. Designers may have some controls over the typography. For example, designers can set a priority typeface list and let the user's computer match designers' preferred typeface, or use GIF, JPEG formatted graphic typography and text instead of plain hypertext. The problem with setting the text as a graphic, however, is the large file size. Too many graphics can make the download speed very slow. If a homepage does not load quickly, visitors can lose interest and jump elsewhere.

**b. Animated Web Site**

By contrast, animated Web design allows lots of flexibility for designers to treat text. Since the text can be designed in motion, the font size and typeface limitation in static Web design are not a problem in animated Web design. Font size can be increased to a very large size and this can change while users move their mouse over it. There is also more flexibility

in the text alignment issue. Text can be treated as an image in animated Web design and the alignment of text can interact with shapes, spaces and other design elements. Compared to static Web design which can only set text in certain areas, animated Web design can set text either in motion or static. The contrast between static and dynamic text can also help establish a visual hierarchy.

The end user's computer system settings have no effect on Web animation. Using Macromedia Flash as an example, the final compressed Flash file can be played on any browser, or any platform. Users cannot change the design with their own settings. This helps users understand the designer's intent with visual and informational hierarchies.

The examples shown below are the homepages of a design firm called MONO crafts. They did many experimental typography designs using animation. The characters fly out when the user moves the mouse, giving the user the sense of using the mouse to write the content (Fig. 5-5). The navigation bar in the middle of the page will automatically scale up and down according to the mouse's movement of the user's mouse (Fig. 5-6). Using animation in typography design, can increase readability and legibility without worrying about file size because of the vector-based format. The vector-based graphics can be loaded and generated easier and faster on the Web. Also, video and audio clips may be easily integrated as well. Graphics can be exported from Macromedia Freehand, Adobe Illustrator or CorelDRAW, and edited with Macromedia Flash. There is a wide range of functions for animating and integration of special graphical effects. Many creative applications of the format provide proof for its flexibility as a web tool. For instance, it also permits progressive upload of data (A page may be viewed even before the whole file is loaded).


**Figure 5-5. Information Page**


**Figure 5-6. About Page with Buttons Zoom In**

## 5. Visual Elements

An image is comprised of many different colors and shapes to represent certain messages, whether it is a mass produced photograph or a hand drawn illustration. An image is received by human eye, and then transferred to the brain. According to experiences previously stored in the mind, the brain analyzes the visual messages from the eyes, and creates a 2D or 3D illusion. A specific image can send messages more directly and stronger than a group of abstract words. Moreover, the human eye is more attracted to moving objects than still objects. Evolution has trained the eye to be constantly on alert for moving objects that can signify danger or a change in the environment. This makes animation highly effective in guiding the viewer through the key points of a composition.

### a. Non-animated Web Site

As compared with text, images, such as page headers and representative graphics, are a secondary communication method in static Web design. Graphics are used more often as an enhancement to static Web sites. Designers use images cautiously because images can cause

problems in download speed, resolution, etc. In many cases, only small-sized images or visual elements such as lines, circles and squares are used in complicated static Web sites. More and more image collages are being used in static graphic design because only one image often cannot represent a concept thoroughly. Design elements such as lines that can suggest direction and motion are also being used more and more often. A static image cannot represent a rapidly changing world. A large part of information on the Web is to explain a process, such as installation steps of a product. With a still image is impossible to communicate this procedure. Static Web designers tend to use text as the method to explain a procedure.

In static Web design, more and more designers use still images or design elements to simulate a movement.

- Sequenced still images being put together was the initial idea of animation. It has some similarities, but it represents a procedure instead of movement.
- Using diagonal, slant, blur themes, curvature ranges, and asymmetry in abstract shapes simulate motion.
- Using dynamic lines to suggest direction, imitating movement.
- Using contrast of size, space, and balance creates the illusion of movement

**b. Animated Web Site**

Motion is innately intriguing to the human eye. If something moves, we are often compelled to notice it. Animation not only grabs our attention but is also an effective way to communicate information. Most people subscribe to a "show, don't tell me" attitude. The animated Web uses image as the first class material for communication. Illustrations,

geometric shapes, photos, icons, and all sorts of visual elements can be used in animated Web design. A piece of animated graphics can, in principle, display anything imaginable—from a primitive blinking text banner to a Flash animation. Graphics, a more universal method to communicate, can get a better result. Motion and timing and sound together can add a visual space into a still image. The following design methods are been used to deal with images in Web animation:

- Acceleration or deceleration is often used to simulate the movement of an object. Adding some second derivative will make its movement more natural and engaging.
- Curvilinear motion paths will make a motion more organic.
- Third dimension is a simple trick of enlarging or reducing an object dynamically, thus giving it an impression of "emerging" or "sinking" relation to the plane of the screen.
- Color and texture effects can mask the linearity of a motion. Combined with a gradual darkening/lightening, transparency variation, or a moving highlight even monotonous progression could make the motion interesting.
- Transformation of any object, such as shape morphing or tweening, forces viewers to watch it with much closer attention.
- Overlapping the consecutive animation stages so that the entire clip looks more dynamic makes the possible deficiencies of each single object's behavior less noticeable.

**5. Site Usability**

It is crucial for a Web design to be easy to use, to provide enough messages for users to understand, and to be convenient for users to find information without searching through the whole site. The site usability tests a site's navigation systems, user interface, and cognition. The author analyzes two categories of site-commercial Web sites and educational Web sites. In each category, the author selects two Web sites in which, one use animation and the other does not.

**a. Commercial Web Site**

The furniture retail market is a growing market and in recent years, more and more furniture buyers purchase items from the Internet. Online shopping makes it possible to never leave the home and customers do not have to travel from store to store in order to find a satisfying piece of furniture. Many furniture retailers offer free delivery to attract more and more people to shop online. At the same time, customers demand more detailed information and convenience when using an online furniture store. According to the author's research, most online furniture stores, such as Abracadabra Furniture Online (Fig. 5-7) and Furniture-On-Line.com (Fig. 5-8) still use traditional static HTML text-based Web formats. Both companies have listed all the items online with short descriptions, measurements, and low quality photos. It is hard for users to make a decision without seeing the furniture from different angles or predicting the position in the actual room. Buyers have to guess what other parts of the furniture looks like and try to imagine how it will look in their home.

Furniture.com is a leading e-commerce innovator in the growing U.S. furniture market, offering more than 50,000 furniture items all of which can be viewed and purchased


**Figure 5-7. Abracadabra Furniture Online**


**Figure 5-8. Furniture-On-Line.com**

online. In their popular homepage, Furniture.com offers a Room Planner section (Fig. 5-9) in which online shoppers can visualize how furniture items will appear in their own homes.

Room Planner has a drag-drop function that allows furniture buyers to grab, move, scale, rotate, and view products that reside in a database of over 50,000 items. It also provides an animated tour to teach buyers how to use this application, and gives a 3D version image to every piece of furniture. Users can use their mouse to view the furniture from any angle. When users like what they see, they simply push a button and all of the product information, including product ID, price, size, and color passes to the e-commerce application that handles the transaction. The user only has to drag, drop, and click. Developed by InterNoded Incorporated, Room Planner is a 100% Macromedia Flash-based application. As mentioned in chapter 2, Flash is the most popular application designed for Web graphics and animations.


**Figure 5-9. Room Planner**

"Static HTML falls short in delivering a positive and immersing furniture-buying experience. Meanwhile, buying a $2000 sofa requires foresight and planning. Will the couch fit next to the piano? Will it look good facing the window?" (Macromedia.com 1999, p.4) By using animation in their Web design, furniture retailers solve the problems of showcasing and selling furniture on the Web. Room Planner delivers an interactive and visually enhanced environment, in which customers input room dimensions, populate the room with new and existing furniture items, and view the selection in a customized online floor plan. "By providing a visual layout environment online, Flash enables our customers to avoid the mental measurement mistakes that exist offline" (Macromedia.com 1999, p.4).

Under the Room Planner section, an animated visual tour called *What is the Room Planner* teaches customers how to use this application (Fig. 5-10). From the beginning to the end, viewers only need to push the "NEXT," "BACK," or "REPLAY" buttons to move between pages. The moving mouse demonstrates how a user can choose, drag-and-drop, or change an object and its dimension. It also provides a short description on the right side of the page, giving a brief explanation of what the application can do. The animated application

introduction is easier to understand and the sequences simpler to follow than a static text based introduction.

Satisfied customers have rated Furniture.com as the "Best of the Web" by Forbes.com, because of its convenient online services, animated Room Planner application, and 3D furniture viewing system (Fig. 5-11).

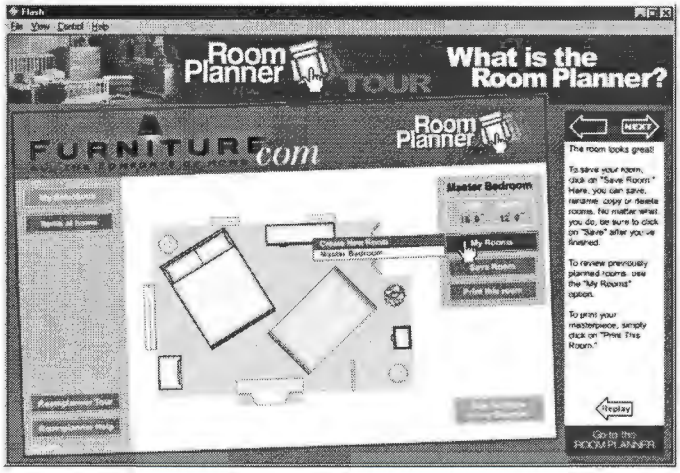


**Figure 5-10. Room Planner Tour**


**Figure 5-11. Furniture.com-3D imagery**

**b. Educational Web Site**

Researching and learning from the Internet is a common way of studying for today's students. The Internet is a positive force in children's education, according to the findings in a survey from the US National School Boards Foundation and Children's Television Workshop. Over 40 percent of 9-17 year old students say the Internet has improved their attitude to attending school. Almost half of children in households that are connected to the Internet go online primarily for schoolwork and 53 percent of adults in these households go online for the same reason. Data from the Second International Technology in Education

Study (SITES) show that nine out of ten elementary, intermediate and secondary level schools in Canada have access to the Internet for educational purposes. Teenagers and children constitute one of the fastest growing Internet populations, with 77 million under 18 year olds expected to be online globally by 2005. They also constitute the most important user population, with their adoption of the Net essential to ensuring its future.

To make the learning experience easier and more fun, many educational sites or programs involve animation as a tool to explain a complicated subject. For instance, the National Geographic site (http://www.nationalgeographic.com) demonstrates a kelp forest, located in Northern California, by bringing the underwater forest and its inhabitants to life in a rich, animated story that the visitor can control every step of navigating (Fig. 5-12, 5-13).

Animated with Flash, Terra Incognita, the key designer and animator of the Kelp Forest site team, created a dive-through-the-ocean submersible experience (Fig. 5-13). Via a virtual submarine, visitors can journey from the surface to the bottom of the Monterey Bay to learn about the flora and fauna that thrive in the underwater habitat. When viewers click the

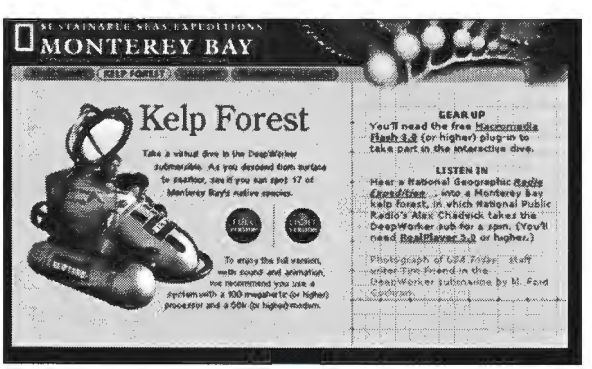


**Figure 5-12. the Homepage of Tour to the Kelp Forest**


**Figure 5-13. Tour the Kelp Forest via virtual submarine**

buttons at the lower right side of the page, the submarine starts to sink, and the inhabitants and environment begin to change. Terra's team imported bitmap images of aquatic animals, birds, and mammals and then used Flash to convert the images to vector format for easy scaling and manipulation. Animated animals, birds, fish and kelp give a live effect of the forest. Further more, viewers can learn the names and features of animals and kelp by clicking on each image.

Designers illustrated the Giant Kelp and Bull Kelp that populate the forest. For the Giant Kelp, they created a model version of the flora that could be modified and exported into Flash. The team then created four primary fronds and duplicated them to make the entire plant. Designers flipped, stretched, and re-colored the kelp symbols so that the seaweed appeared different at every level of the forest. Terra Incognita integrated ambient and event-driven sounds from the actual Deep-Worker submersible, a state-of-the-art underwater craft used to explore marine sanctuaries. "Flash is the best tool for combining animation and sound, and enables us to create and deliver a rich multimedia experience" (Incognita 2000, p.3).

"With animation, our sites become engaging, immersive story spaces. This engagement is crucial for creating compelling content that the user loves to explore. Simply put, animation lets us tell the stories we want to tell" (Incognita 2000, p.3).

Compared to the National Geographic site, some static online educational sites seem less convincing in terms of visual communication. For example, under Discover.com site (Fig 5-16), there is a gallery page that contains ancient life, anthropology, biology and astronomy and physics and so on. Since there are only static features on this site, site builders provide only static images and a paragraph of description. For people who would like to learn

more about the above subjects, they will have to read the text and look at the low quality pictures. From the visual communication point of view, it is not impressive and viewers may not understand or remember this site.

It would make much more sense if the designers designed an interactive Web site with animation to introduce the Cateye Nebula (Fig. 5-14, 5-15) from different angles. Or, designers could make the page into a spaceship so it could take the viewers into the galaxy. By contrast, on a similar subject, the Web site designed to introduce the ATLAS IIIA rocket and its launch process has done a much better job (Fig. 5-16).

Designed by SPACE.com, this site has three sub-links: Stages, Mission Profile and Facts. At the Mission Profile page, an interactive animation demonstrates the launch process in which viewer control the steps of deploying the satellite into orbit. It clearly demonstrates

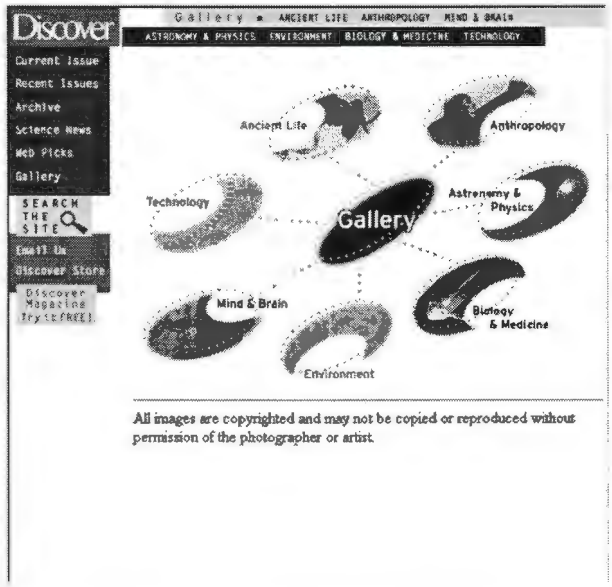


**Figure 5-14. Discover.com-Gallery**


**Figure 5-15. Discover.com-Cateye Nebula**


**Figure 5-16. Space.com-Atlas IIIA Rocket**

how to send a satellite in orbit and how it works, from the rocket liftoff to each booster separation.

## 7. Analysis of Experimental Web Sites Design

Based on the studies and research conducted in the previous chapters, and the design experience of the author, the author has designed an animated Web site and a non-animated Web site. Analysis of the comparisons between animated Web design and non-animated Web design will be accomplished in this section.

### a. Information Development

Static and animated Web design share the same preparation process at the beginning, which is to define the project and user group. The purpose is to have a clear view of information architecture, design style, and potential audience group. To organize the information content into a hierarchical sequence is also part of information development, but static and animated Web design have a different approach.

The purpose of both a static and animated Web site is to narrate a story. The task of the Web sites is to present the author's thoughts and to communicate plot to the audience. Target users can be anyone who has Internet access. Any age group, education background, and profession can be the potential audience.

The following paragraphs show the information that will put into the static Web site and the animated Web site.

A Wall Street trader, James, approximately 28-32 years old, is tired of his dull routine job, but feels nothing can change it. He feels trapped in this job and powerless. He has never asked for help from other people because he is too independent and believes nobody will care about his feelings. One day, after a long and tiring day, while James is on his way home, a strange man stops him and tries to give him a mysterious object. James runs away.

When he gets home, James falls asleep right away. Suddenly, he finds himself standing in front of a very surrealistic scene. He starts jumping on some huge numbers. He feels he has to run without resting. Then he comes to several staircases on the ground. Each staircase has a door closed at the end, leading to an empty space. James opens one of the doors. Suddenly, there are endless doors that line up besides a long, long hallway. As James goes through one of the doors, he starts to fall. When he opens his eyes, he sees he has been locked into a falling time gauge. He sees there are thousands of time gauges falling from the sky, each containing a person inside falling from the sky. Without thinking, the time gauge breaks on the ground, and he falls off a cliff. A huge hand grabs him, and suddenly he wakes up. After he is awake, he finds in his hand the mysterious object the strange man tried to give him earlier that day.

Static and animated Web design have a different approach in terms of information organizing and planning. Static Web site normally presents information in a chronological sequence, a logical series of topics progressing from the general to the specific, or sometimes even alphabetically sequenced, as in indexes, encyclopedias, and glossaries. The experimental static Web site has been divided into five categories. The arrangements of these five categories are proposed in hierarchical scheme as shown in Figure 5-17. The categories are on the same level of information hierarchy and user can link back and forth among them. Simple sequential organization works for smaller sites like this experimental site design. More complex sites may have one or more pages of digressions, parenthetic information, or links to information in other sites.

An animated Web site, however, organizes its information in a timing sequence. A storyboard is a series of drawn images that graphically portray the action described in the script (Fig. 5-18). The storyboard allows the author to see and design the content of the

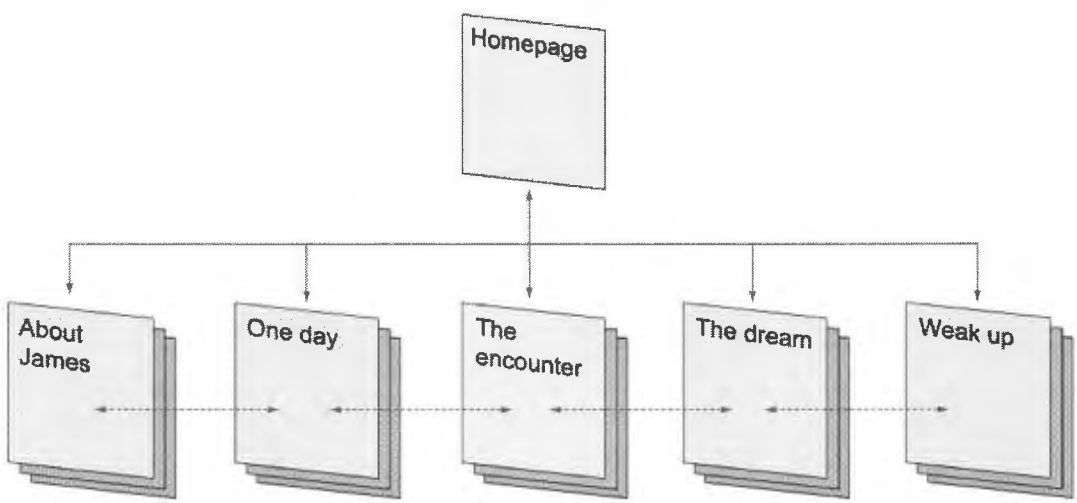


**Figure 5- 17. Hierarchical structure**

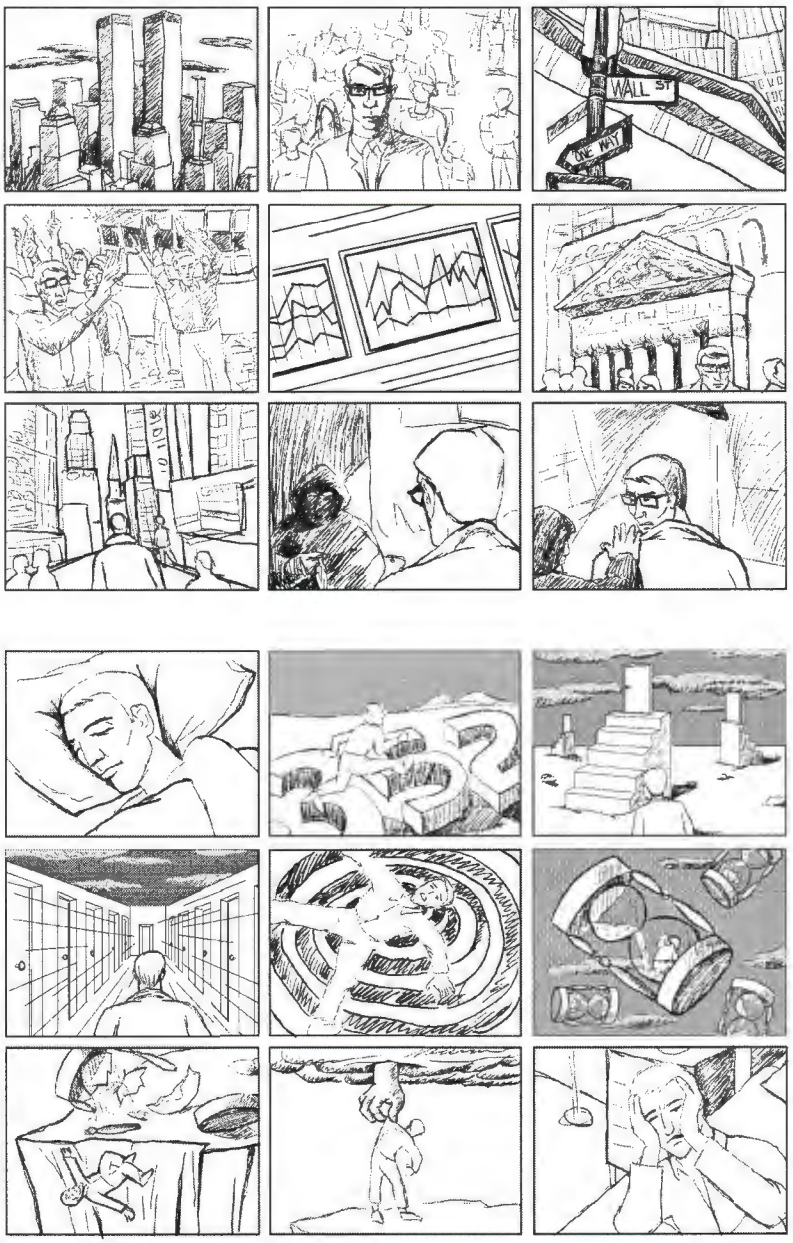


**Figure 5-18. Storyboard of July 24th**

animation. At the same time, the sound effects or key music is undertaken. The soundtrack can also help the author to determine the length of each scene since synchronization of the picture is the key feature to time the action accurately, and the timing sequence of an animation will heavily rely on the soundtrack.

**b. Navigation Design**

A consistent and predictable navigation system gives the user a sense of site's organization, and makes the logic and order of Web site visually explicit.

The static Web site provides five hypertext links on each page (the story has been divided into five sections) (Fig. 5-19, 5-20, 5-21, 5-22). When users click on a hypertext link in the site they are transported from one category to another. Also, five text-based hypertext links are provided at the bottom of each page for users to browse the site with lower version of browsers. For the static Web designer hypertext links are a mixed blessing. The radical shifts in context that links create can easily confuse Web user, who need organized cues and interface elements if they are to follow and understand hypertext links from one Web page to another. Since the experimental static Web site only has two levels of information, the main page and five same level categories, it is easy for users to follow by clicking hypertext links. For complex Web sites, such as Yahoo.com, Amazon.com, users would be easily lost in different levels of page. The reading behavior of Web user shows that 75% users do not browse Web sites by the order that is provided in the navigation bars. Users tend to find out what is the most important or interesting information at first, and then jump directly to the page (Nielsen, 2000). It is also studied by Poynter Institute that Web users tend to frequently alternate between multiple sites. "They would read something in one window, then switch to another window and visit another site, and then return to the first window and read some more on the first site." The lesson for site designers is that "users are not focused on any single site." (Nielsen, 2000)

It is unpredictable how the Web users would browse the static site even when designers have provided simple headlines, consistent link color or styles, and standard

terminology. The author believes that animated Web site can make big difference in terms of navigation design.

Animated Web sites are more designer-oriented, which means designers control the navigation process, providing the existing information sequence in a timely order. Web users do not have to browse all the information themselves, thereby reducing the risk of being lost in hyperspace. Animation is also good for indicating dimensionality in transitions. It can be used to indicate movement back and forth along some navigational dimension (Nielsen, 2000). This helps user to understand designer's intention in terms of navigation and the structure of the site.

### c. Page design

Web page design requires clarity, order, and trustworthiness in information sources, whether they are static Web pages or animated Web pages. The spatial organization of graphics and text on a Web page can engage the user with graphic impact, direct the user's attention, prioritize information, and make the user interact with the Web site.

#### *i. Text*

Static Web page design tends to be text-oriented. The static Web designer usually gives the majority of page space to text content. The usage of different font faces, sizes, type styles, and colors can help to define visual hierarchies. As mentioned in the earlier sections, on 72 dpi screen resolution, san serif typefaces are more readable as titles and labels. Therefore, the author chose a typeface incorporate with the topic and has lot of san serif features, and to set content text in serif typeface because it helps to facilitate horizontal flow of reading (Fig. 5-21, 5-22). Static Web designers may concern about the legibility and

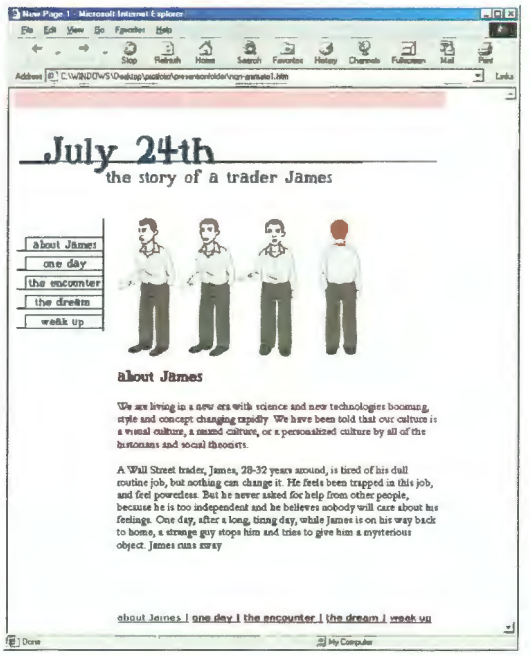


Figure 5-19. The Homepage

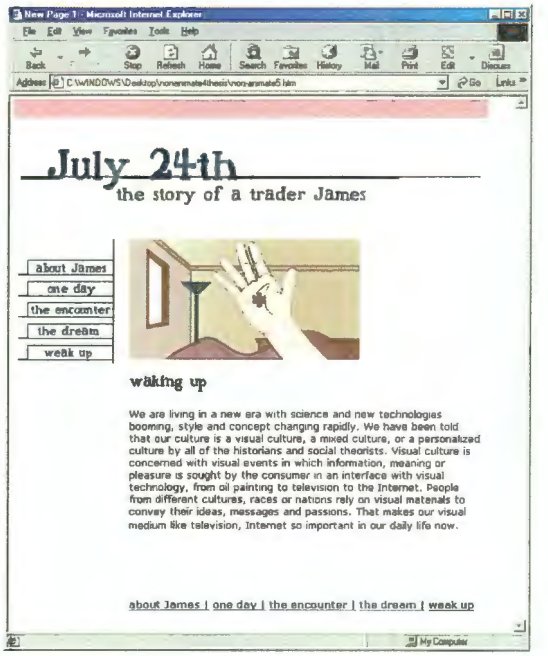


Figure 5-20. The Waking Up page


Figure 5-21. The One day page

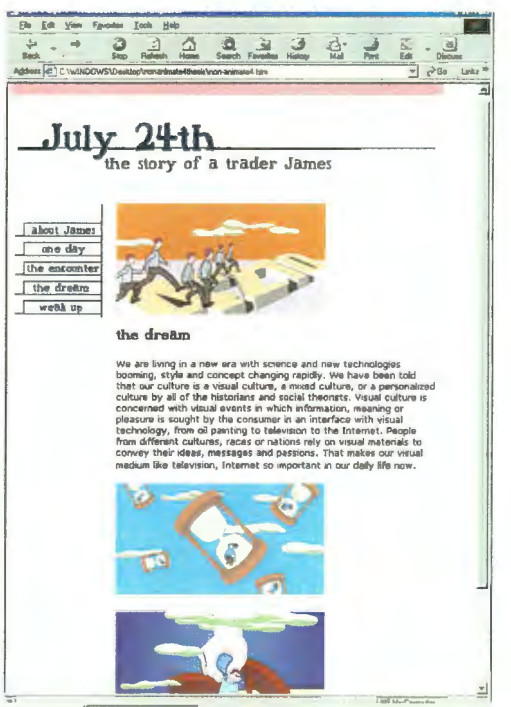


Figure 5-22. The Dream page

readability at the design stage, but the preference settings on end users' computer system varies on font face, size and color. This would cause potential problems in terms of information communication.

Font sizes, colors, and styles in animated Web design can be changed while users interactive with it. This extends the limitations of text treatment in Web design. The end user's computer system setting will have no effect on Web animation. Users cannot change the designs of font with their own computer (Fig. 5-23).

***ii. Image***

Images are secondary communication elements in static Web design. Images or graphics are used as a unique visual identity to the Web site, such as headers, buttons, or footers. A consistent "signature" graphic and page layout allows the reader to immediately know what the main point of the documents is, and what relationship the page may have to other pages (Fig. 5-19, 5-20).

Animated Web uses images as the first class material for communication. In the experimental animation design, the author uses image as the major communication method to narrate the story. Image in sequences can help the users to visualize information, three-dimensional structures or continuity in transitions (Fig. 5-23, 5-24, 5-25). Image is more universal compares to text or language in terms of communication.

***iii. Consistency***

Just as in traditional print publishing, static Web sites establish a set of type style settings consistently throughout the site. Consistency in static Web design gives polish to a site and encourages visitors to stay by establishing an expectation on the structure of the text. The author uses a set of font style settings, page layouts, and headers to build consistency.


**Figure 23. The Intro. Page of animated July 24th Web site**

**Figure 24. The Intro. Page of animated July 24th Web site**

Animated Web establishes its consistency not only with type, but also through illustration styles, color palette, sound, and timing settings. Consistency in animated Web design helps the users to understand the continuity of information and movements, and gives a sense of how the individual pieces integrate collectively within the system.

**Figure 25. The Intro. Page of animated July 24th Web site**

In this chapter, the author analyzed and evaluated several static and animated Web sites based on the criteria of information hierarchy, text legibility, functional image and site usability. Animated Web tends to be more designer-oriented compared to static Web in terms of information navigation. Interactive and animated text treatment enhanced static Web site, added flexibility and increased legibility to static Web design. Graphic-oriented Web animation has powerful impact to the viewer in terms of visual communication.

Sound also helps the narration of the story. Sound effects and conversation helps the viewer to focus on the plot and creates a realistic aura for the viewer. Since this thesis mainly focuses on visual communication aspects, sound will not be addressed in depth in this thesis.

# CHAPTER 6. CONCLUSION

The World Wide Web is the fastest growing medium today. Newer technical supports, newer Web design software and newer devices are coming and to competing with each other in this fast growing technology. Meanwhile, more users are joining in this enormous global wide networking.

Faster processors, modems, various Internet accesses, and enhanced Web browser technologies enable multimedia, animated Web site runs fast and smooth on various platforms and browsers. New mark-up languages, such as XML, DHTML, and PHP, are designed for multimedia and interactive Web design tasks. Software manufacturers aimed multimedia and animated Web design market, have released software such as Flash, Golive, and Dreamweaver to fulfill the demands Web users and designers. From the trend of Web design software and Internet devices, we can see the future of Web design tends to multimedia, interactive and animated design.

Non-animated Web design is built upon many design principles. Many of these principles are applicable to both animated Web design and non-animated Web design, such as the grid system, structure, simplicity, repetition, consistency, and visual hierarchy. Animated Web sites add more features to Web design, such as motion and sound. Animation principles such as timing, staging, anticipation, exaggeration and so on are applied to the author's experimental animated Web design. By applying these principles, the animated experimental site results an effective method of communicating information. For instance, information hierarchy can be defined in the timing sequence.

The basic Web design principles applied in static Web design, also perform fundamental roles in animated Web design. Animation enhances static Web design and adds new features to it. At the same time, animation extends the communication language of static Web design. In terms of information navigation, animated Web tends to be more designer-oriented than static Web. Interactive and animated text treatment enhances the static Web site, adding flexibility and increasing legibility to static Web design. Graphic-oriented Web animation has a powerful impact to the viewer in terms of visual communication.

Application of the design principles such as concept, structure, grid, hierarchy, consistency, repetition and simplicity are the basis for a successful Web site. Defining a site concept before starting the design process can help the designer understand the concerns of client in reaching its target audience. Defining a concept also helps clarify design decisions during the process. Site structure design help designers divide and organize information. This structure helps decide the size and depth of the site. In the experimental Web design, the author followed the site structure design principle, and developed a hierarchical structure for the static site to organize the information. In animated experimental Web design, the storyboard became the "site structure."

Grid system, hierarchy, consistency, repetition and simplicity can mainly apply to site and page design. To keep the site unified with a consistent feel and look, grid, repetition and simplicity should be applied to the page design. In both the animated and static experimental Web design, the author applied consistency, repetition, simplicity and grid principles to the title, buttons, graphics, layout and character design.

Hierarchy can be applied to both page and site design to create a clear and easy to understand visual and informational system. In the experimental Web design, the author established the hierarchy through the use of typeface, size, color, shape and angle.

Based on the research and studies, animated Web has advantages in showing continuity in transitions such as showing something with several stages. Web users can easily understand the transitions between different stages by watching animation demonstrate the process. Static Web tends to use text to explain the process, and the result could be confusion.

Secondly, animation has advantages in enriching graphical representations, and can help Web users visualize three-dimensional structures. "Animation provides the perfect support for illustrating any kind of change operation" (Nielsen, 1995). In Web sites that demonstrate the usage of products or tools, emphasize the three-dimensional nature of objects and their spatial structures, or show multiple information objects in the same space, animation are undoubtedly superior to static Web sites.

Amy Franceschini, a multimedia artist and interface designer, claims that the future, the Web will not have text but will have streaming audio and motion video (Franceschini 1997, p.45).

Thirdly, an animated Web site has advantages by mimicking movement and emotions in real time. Instead of reading text or looking at still pictures as in a static Web site, an animated site allows users to visualize an event, story or procedure in virtual reality.

Finally, animation can draw a user's attention to information the designer wants to emphasize and alert the user to updated information by highlighting an important announcement, or indicating a clickable area.

Animation has the above advantages in terms of visual communication, but when and how to use it should always follow both animated and static Web design principles. Even if the site is a fully animated Web site, one animation at one time principle, or secondary action principle should be applied to the animation design. Too many animations on one page, or inappropriate use of animation counters the design principles.

The Web designer, needs to be cautious of when and how to use animation in Web design. Animation should be applied only when appropriate. To apply too many animations in one page or navigation bar, for example, would be highly distracting to the user's attention. As a result, Web users might leave the page or not get enough information.

The author studied historical and current Internet and World Wide Web technologies in chapters 1 and 2. In chapters 3 and 4, the author studied the design principles of animated and non-animated Web design. The author found that both animated and static Web designs share many common aspects, such as basic site structure, text legibility, visual consistency, and design simplicity. In the author's opinion, static Web design serves as a fundamental for animated Web design. Static Web design principles can be applied to animated Web design. In chapter 5, the author compared a static Web design to an animated Web design based on information hierarchy, text legibility, functional image, and site usability.

It is suggested that an animated Web designer should study the principles of static Web design, such as text legibility and readability, consistency, visual and information hierarchy, and the principles of animation, such as timing, staging, secondary action, and sound effects, and so on.

This thesis can be used as a basis for designers who want to explore in greater depth communication possibilities in Web design. Additional research in the areas of motion

design, the relationship between sound effects and movement rhythms, and the relationship between static dynamism and real animation is suggested.

# APPENDIX. ACCOMPANYING CD ROM AND OPERATING INSTRUCTIONS

System requirements for computer disks: IBM PC or Macintosh Power PC; hard disk (10 MB minimum); Windows 98/2000 or Mac OS 8; Macromedia Flash player, Internet Explorer.

CD ROM contains the Flash format of final presentation and 8 examples Web animations that the author analyzed and compared in thesis.

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